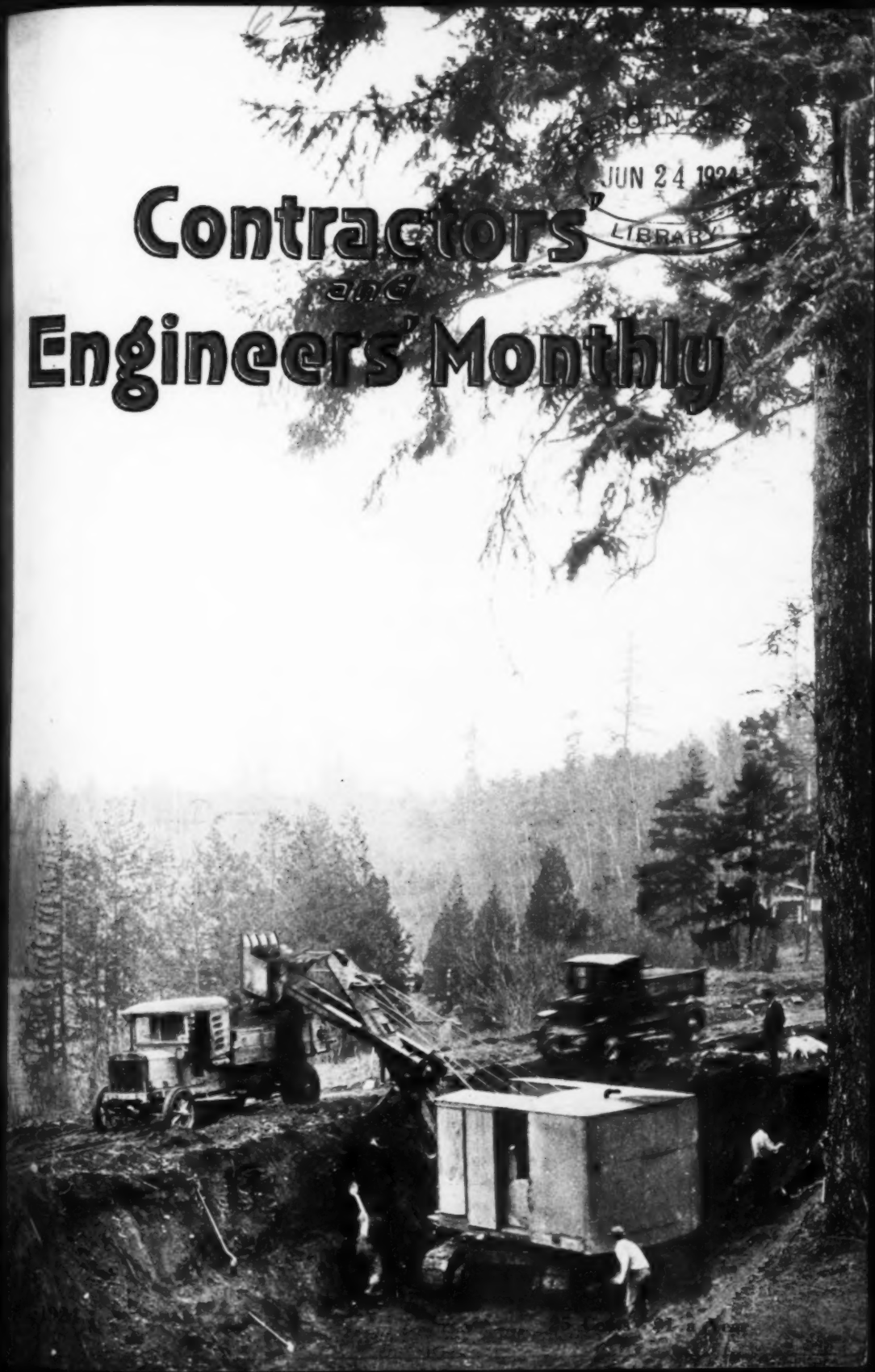
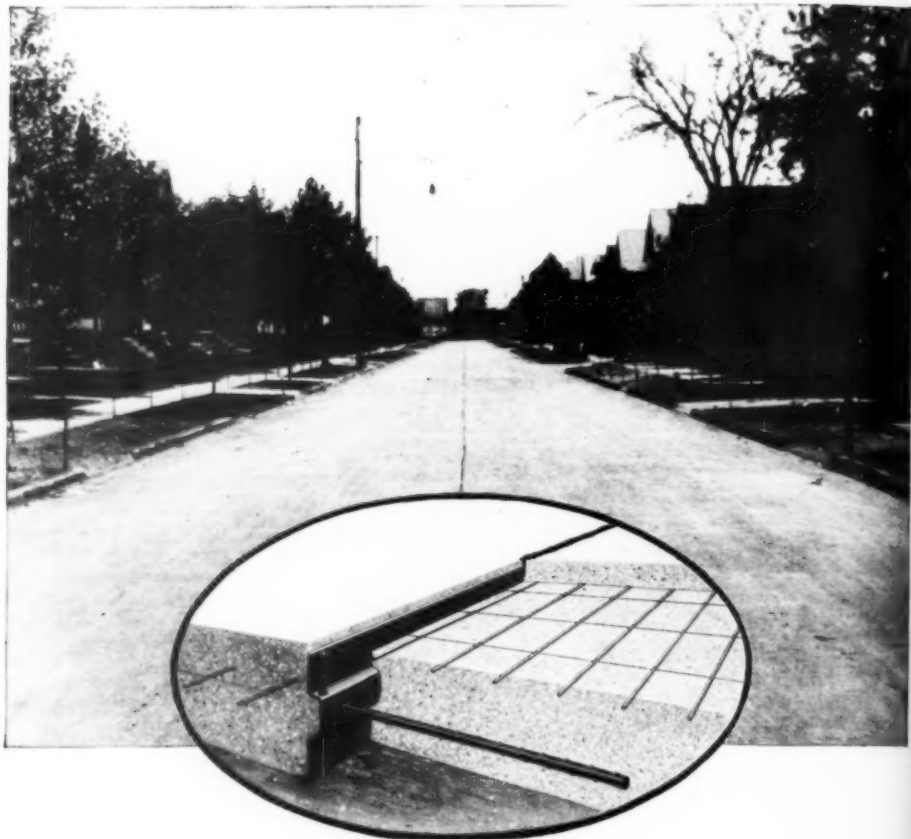


JUN 24 1924

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# Contractors *and* Engineers' Monthly





## Reinforced Roads Worth More—Cost Less

You can build cheaper roads that may look as good as the reinforced road when new, but it is the reinforced road which stands up for years under the terrific grind of city street or urban highway. Roads reinforced with Truscon Wire Mesh and Longitudinal Contraction Joints mean lasting, permanent pavements at less cost. The wire mesh checks any tendency towards cracking and provides greater uniformity of strength in the concrete.

If you are interested in better roads write for a copy of the book "Modern Road Construction" which covers the subject in detail.

**TRUSCON STEEL COMPANY, Youngstown, Ohio**

*Warehouses and Sales Offices from Pacific to Atlantic. For addresses see 'phone books of principal cities. Canada: Walkerville, Ont. Foreign Div.: New York.*

**TRUSCON**  
WIRE MESH AND  
CONTRACTION JOINTS

VOL. VIII. No. 6

CONTRACTORS' & ENGINEERS' MONTHLY

JUNE, 1924

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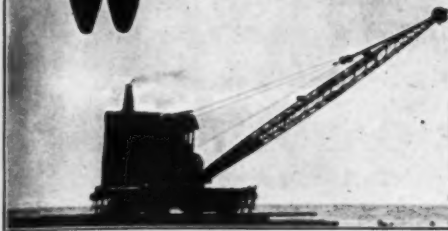
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# Where to Purchase



A comprehensive classification of the leading machinery and supply manufacturers arranged for the convenience of contractors, engineers and public officials who may wish to secure information about construction equipment. A star (\*) before the manufacturer's name indicates that his advertisement appears in this issue.

## AIR COMPRESSORS

- \*Domestic Engine & Pump Co., Shippenburg, Pa.
- Allis-Chalmers Mfg. Co., Milwaukee, Wis.
- Chicago Pneumatic Tool Co., New York
- De La Vergne Machine Co., Trenton, N. J.
- Fairbanks, Morse & Co., Chicago, Ill.
- Gardner Governor Co., Quincy, Ill.
- General Electric Co., Schenectady, N. Y.
- Hardie-Tynes Mfg. Co., Birmingham, Ala.
- Ingersoll-Rand Co., New York
- Nordberg Mfg. Co., Milwaukee, Wis.
- Norwalk Iron Works Co., South Norwalk, Conn.
- Schramm, Inc., West Chester, Pa.
- Sullivan Mch. Co., Chicago, Ill.
- United Iron Works, Kansas City, Mo.
- Westinghouse Trac. Brake Co., Wilmerding, Pa.
- Worthington Pump & Mch. Corp., New York.

## AIR LAMPS

- General Electric Co., Schenectady, N. Y.
- Westinghouse Elec. & Mfg. Co., E. Pittsburg, Pa.

## ARTESIAN WELL DRILLS AND PUMPS

- Am. Well Works, Aurora, Ill.

## ASBESTOS PRODUCTS

- \*Carey Co., Philip, Cincinnati, Ohio.
- Darcoid Co., Inc., New York.
- Keasbey & Mattison Co., Ambler, Pa.
- Milkesell Bros. Co., Wabash, Ind.
- Norristown Mag. & Ash. Co., Norristown, Pa.
- Sail Mountain Co., Chicago, Ill.

## ASH HANDLING MACHINERY

- \*Bay City Dredge Wks., Bay City, Mich.
- \*Haiss Mfg. Co., Geo., New York
- \*International Motor Co., New York.
- Bartlett & Snow Co., C. O., Cleveland, O.
- Brown Hoisting Mach. Co., Cleveland, Ohio.
- Byers Mach. Co., Ravenna, Ohio.
- Chain Belt Co., Milwaukee, Wis.
- Gifford-Wood Co., Hudson, N. Y.
- Green Eng. Co., East Chicago, Ind.
- Jeffrey Mfg. Co., Columbus, Ohio.
- Lakewood Eng. Co., Cleveland, Ohio.
- Link-Belt Co., Chicago, Ill.
- Mead-Morrison Mfg. Co., E. Boston, Mass.
- Portable Machinery Co., Passaic, N. J.
- Robins Concr. Belt Co., New York.
- Webster Mfg. Co., Chicago, Ill.
- Weller Mfg. Co., Chicago, Ill.

## ASPHALT

- \*Barber Asphalt Co., Philadelphia, Pa.
- \*Barrett Co., New York.
- \*Kentucky Rock Asphalt Co., Louisville, Ky.
- \*Standard Oil Co. (Indiana), Chicago, Ill.
- \*Texas Co., New York.
- \*Warren Bros. Co., Boston, Mass.
- Atlantic Refining & Asphalt Corp., Phila., Pa.
- Gulf Refining Co., Pittsburgh, Pa.
- Headley Good Roads Co., Philadelphia, Pa.
- New Orleans Refining Co., New Orleans, La.
- Pioneer Asphalt Co., Lawrenceville, Ill.
- Sinclair Ref. Co., Chicago, Ill.
- Standard Oil Co. of Calif., San Francisco, Cal.

\* Indicates that the manufacturer carries an advertisement. See index facing inside back cover.

- Standard Oil Co. of La., New Orleans, La.
- Standard Oil Co. of N. J., Newark, N. J.
- Standard Oil Co. of N. Y., New York.
- U. S. Asphalt Refining Co., New York.

## ASPHALT BLOCK

- Hastings Pavement Co., New York.

## ASPHALT CUTTERS

- Dayton Pneumatic Tool Co., Dayton, Ohio.
- Chicago Pneumatic Tool Co., New York.
- Ingersoll-Rand Co., New York.
- Sullivan Machinery Co., Chicago, Ill.

## ASPHALT KETTLES. (See Kettles for Asphalt and Tar Heating.)

## ASPHALT PLANTS, TOOLS, ETC.

- \*Barber Asphalt Co., Philadelphia, Pa.
- \*East Iron & Machine Co., Lima, Ohio.
- \*Littleford Bros., Cincinnati, O.
- \*Warren Bros. Co., Boston, Mass.
- Austin Machinery Corp'n, Toledo, O.
- Bacon Co., Edw. R., San Francisco, Cal.
- Cummer & Son Co., F. D., Cleveland, O.
- Farasey Co., J. D., Cleveland, Ohio.
- Hetherington & Berner, Indianapolis, Ind.

## ASPHALT ROLLERS. (See Road and Paving Rollers.)

## ASPHALT SURFACE HEATERS

- \*Barber Asphalt Co., Philadelphia, Pa.
- \*Equitable Asphalt Maint. Co., Kansas City, Mo.
- \*Littleford Bros., Cincinnati, O.
- Chausse Oil Burner Co., Goshen, Ind.
- Hauck Mfg. Co., Brooklyn, N. Y.

## BACKFILLERS

- \*American Cement Mch. Co., Inc., Keokuk, Ia.
- \*Bay City Dredge Wks., Bay City, Mich.
- \*Construction Mch. Co., Waterloo, Iowa
- \*Koehring Co., Milwaukee, Wis.
- \*Pawling & Harnischfeger Co., Milwaukee, Wis.
- Austin Machinery Corp'n, Toledo, O.
- Byers Machine Co., Ravenna, Ohio.
- Oshkosh Mfg. Co., Oshkosh, Wis.
- Parsons Co., Newton, Ia.
- Weller Mfg. Co., Chicago, Ill.

## BAR BENDERS AND CUTTERS

- \*Koehring Co., Milwaukee, Wis.
- \*Ransome Concrete Mch. Co., Dunellen, N. J.
- Buffalo Forge Co., Buffalo, N. Y.
- Concrete Steel Co., New York.
- Electric Welding Co., Pittsburgh, Pa.
- Hinman & Co., D. A., Sandwich, Ill.
- McKenna Co., Cleveland, Ohio.

## BAR CHAIRS, REINFORCING

- \*Truscon Steel Co., Youngstown, Ohio.
- Concrete Steel Co., New York.
- Universal Form Clamp Co., Chicago, Ill.

## BAR, IRON AND STEEL

- Ames & Co., W., Jersey City, N. J.

# KOEHRING CRANE EXCAVATOR

**DESIGNED FOR GASOLINE—  
Not Merely Powered with a Gas Engine**

## Crane Capacities

No. 1.—7 tons at 12 ft. radius.  
¾-cu. yd. clamshell bucket,  
sand or gravel, at 28 ft. radius.  
Boom lengths to suit conditions.  
4-cylinder, 5x6 in. gasoline  
engine, 1,000 H. P. M.

No. 2.—12 tons at 12 ft. radius.  
Handles following loads sand or  
gravel, (clam-shell buckets):  
¾-cu. yd. at 43 ft. radius; 1  
cu. yd. at 37 ft. radius; 1½  
cu. yd. at 27 ft. radius. Boom  
lengths to suit conditions. 4-  
cyl. 5½x7 in. gasoline engine,  
925 H. P. M.

**T**WO vastly different things—with a big difference, in day-by-day working ability, maintenance and service life! Each type of power demands its own special design throughout the entire machine—gearing for instance.

Compromised design must mean compromised service and service life. This is not a mere opinion—it is a matter of ordinary mechanical engineering knowledge.

The Koehring Company builds no steam Cranes. Gasoline has so proved its efficiency and great money saving that over 80% of Koehring machinery, Cranes, Draglines, Paving Mixers, etc. are now gasoline powered. The Koehring is strictly gasoline design in every detail. This is the first fundamental of Koehring Heavy Duty Construction.

*Write for Crane Excavator Bulletin No. C E.-5*

## KOEHRING COMPANY

Pavers, Mixers, Cranes, Draglines, Gasoline Shovels

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Sales Offices and Service Warehouses in all principal cities

Foreign Dept., Room 1370 50 Church St., New York

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105 Front St. East, Toronto, Ontario

Mexico, F. S. Lazaro, Ciu de  
Mexico, 21, Mexico, D. F.



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Bethlehem Steel Co., Bethlehem, Pa.  
 Buffalo Bolt Co., N. Tonawanda, N. Y.  
 Carbon Steel Co., Pittsburgh, Pa.  
 Carnegie Steel Co., Pittsburgh, Pa.  
 Columbia Steel Corp., San Francisco, Cal.  
 Franklin Steel Works, Franklin, Pa.  
 Gulf States Steel Co., Birmingham, Ala.  
 Hirsch Rolling Mill Co., St. Louis, Mo.  
 Illinois Steel Co., Chicago, Ill.  
 Inland Steel Co., Chicago, Ill.  
 Laclede Steel Co., St. Louis, Mo.  
 Midvale Steel & Ordnance Co., Philadelphia, Pa.  
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 Pacific Coast Steel Co., San Francisco, Cal.  
 Pollack Steel Co., Cincinnati, O.  
 Horace T. Potts & Co., Philadelphia, Pa.  
 Republic Iron & Steel Co., Youngstown, O.  
 Jos. T. Ryerson & Son, Inc., Chicago, Ill.  
 St. Louis Screw Co., St. Louis, Mo.  
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 United Alloy Steel Corp., Canton, Okla.

## BATCH BOXES

Lakewood Eng. Co., Cleveland, O.  
 Western Wheeled Scraper Co., Aurora, Ill.

## BELTING, RUBBER

\*Goodrich Rubber Co., B. F., Akron, O.  
 Allen Mfg. Co., W. D., Chicago, Ill.  
 Cincinnati Rubber Mfg. Co., Cincinnati, Ohio.  
 Fairbanks Co., The, New York.  
 Goodall Rubber Co., Inc., Philadelphia, Pa.  
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 Salisbury & Co., Inc., W. H., Chicago, Ill.  
 Southern Rubber & Belt Co., Houston, Tex.  
 Union Ansbros & Rubber Co., Chicago, Ill.  
 U. S. Rubber Co., New York.  
 Voorhees Rubber Mfg. Co., Jersey City, N. J.

## BINS, STORAGE

\*Atlas Eng. Co., Milwaukee, Wis.  
 \*Austin-Western Rd. Mach. Co., Chicago, Ill.  
 \*Good Roads Mach'y Co., Kennett Square, Pa.  
 \*Hansome Concrete Mach. Co., Dunnellen, N. J.  
 \*Universal Road Machinery Co., Kingston, N. Y.  
 Austin Mfg. Co., Chicago, Ill.  
 Birmingham Tank Co., Birmingham, Ala.  
 Fairfield Engineering Co., Lancaster, Ohio.  
 Gallion Iron Works & Mfg. Co., Gallion, Ohio.  
 Link-Belt Co., Chicago, Ill.  
 Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.  
 Weller Mfg. Co., Chicago, Ill.

## BLAST HOLE DRILLING MACHINES. (See "Well Drilling and Blast Hole Machines")

## BLASTING POWDER (See Explosives.)

## BLOCKS AND TACKLE

Boston & Lockport Block Co., East Boston, Mass.  
 Dobbie Fdry. & Mach. Co., Niagara Falls, N. Y.  
 Upson-Walton Co., Cleveland, Ohio.

## BLOWERS, PRESSURE

American Blower Co., Detroit, Mich.  
 American Gas Furnace Co., Elizabeth, N. J.  
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 Buckeye Blower Co., Columbus, O.  
 Buffalo Forge Co., Buffalo, N. Y.  
 De Laval Steam Turbine Co., Trenton, N. J.  
 Garden City Fan Co., Chicago, Ill.  
 General Electric Co., Schenectady, N. Y.  
 I. L. G. Electric Ventilating Co., New York.  
 Mass. Blower Co., Watertown, Mass.  
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## BLOWPIPES

Oxweld Acetylene Co., Newark, N. J.

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Dietzen Co., Eugene, Chicago, Ill.  
 Keuffel & Esser Co., Hoboken, N. J.  
 Pease Co., O. F., Chicago, Ill.  
 Weber & Co., F., Philadelphia, Pa.  
 Wickes Bros., Saginaw, Mich.

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 Kolesch & Co., New York.

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Abendrecht & Root Mfg. Co., Newburgh, N. Y.  
 Ames Iron Works, Oswego, N. Y.

Babcock & Wilcox Co., New York.  
 Biggs Boiler Wks., Akron, Ohio.  
 Casey-Hedges Co., Chattanooga, Tenn.  
 Chandler & Taylor Co., Indianapolis, Ind.  
 Chatila, Boiler & Tank Co., Chattanooga, Tenn.  
 Cole Mfg. Co., R. D., Newnan, Ga.  
 Erie City Iron Works, Erie, Pa.  
 Flory Mfg. Co., S., Bangor, Pa.  
 Hartley Boiler Works, Montgomery, Ala.  
 Heine Boiler Co., St. Louis, Mo.  
 Houston, Stanwood & Gamble Co., Cincinnati, O.  
 Ladd Co., Geo. T., Pittsburgh, Pa.  
 Leffel & Co., J., Springfield, O.  
 Lord & Burnham Co., Irvington, N. Y.  
 Murray Iron Works Co., Burlington, Ia.  
 New Bern Iron Wks. & Sup. Co., New Bern, N. C.  
 Petroleum Iron Works Co., Sharon, Pa.  
 Schofield Iron Works, Macon, Ga.  
 Traylor Engr. & Mfg. Co., Allentown, Pa.  
 Valk & Murdock Co., Charleston, S. C.  
 Vogt Mch'y. Co., Inc., Louisville, Ky.  
 Walsh & Weidner Boiler Co., Chattanooga, Tenn.

## BOLTS, NUTS, NAILS, RIVETS, SPIKES

American Screw Co., Providence, R. I.  
 Ames, W. & Co., Jersey City, N. J.  
 Bethlehem Steel Co., Bethlehem, Pa.  
 Buffalo Bolt Co., Buffalo, N. Y.  
 Clark Bros. Bolt Co., Middletown, Conn.  
 Erie Bolt & Nut Co., Erie, Pa.  
 Foster Bolt & Nut Mfg. Co., Cleveland, Ohio.  
 Inland Steel Co., Chicago, Ill.  
 Lamsen & Sessions Co., Cleveland, Ohio.  
 Milton Mfg. Co., Milton, Pa.  
 Neely Nut & Bolt Co., Pittsburgh, Pa.  
 Oliver Iron & Steel Corp'n, Pittsburgh, Pa.  
 Pittsburgh Screw & Bolt Co., Pittsburgh, Pa.  
 Progressive Mfg. Co., Torrington, Conn.  
 Republic Iron & Steel Co., Youngstown, O.  
 Rhode Island Tool Co., Providence, R. I.  
 Russell, Burdall & Ward Co., Port Chester, N. Y.  
 St. Louis Screw Co., St. Louis, Mo.  
 Scranton Bolt & Nut Co., Scranton, Pa.  
 Sweet's Steel Co., Williamsport, Pa.

## BRACES, TREENCH

Channon Mfg. Co., Jas. H., Chicago, Ill.  
 Duff Mfg. Co., Pittsburgh, Pa.  
 Kalamazoo Fdry. & Mach. Co., Kalamazoo, Mich.  
 Waldo Bros. & Bond Co., Boston, Mass.

## BRASS GOODS

\*Union Water Meter Co., Worcester, Mass.  
 Glauber Brass Mfg. Co., Cleveland, O.  
 Haydensville Co., Haydensville, Mass.  
 Hays Mfg. Co., Erie, Pa.  
 Mueller Company, Decatur, Ill.  
 United Brass Mfg. Co., Cleveland, O.

## BREAKERS, CONCRETE

Buckeye Traction Ditcher Co., Findlay, O.  
 Chicago Pneumatic Tool Co., New York.  
 Ingersoll-Rand Co., New York.

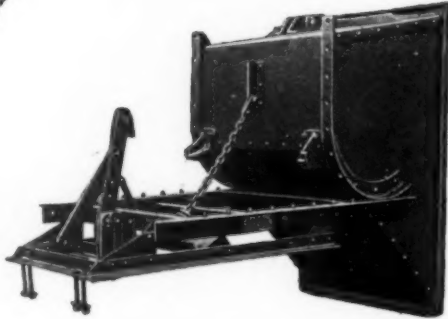
## BRICK, PAVING (See Paving Brick)

## BRIDGES AND BUILDINGS, STEEL

\*Blaw-Knox Co., Pittsburgh, Pa.  
 \*Frederick Snare Corporation, New York.  
 American Bridge Co., New York.  
 Bellefontaine Bridge & Steel Co., Bellefontaine, O.  
 Belmont Iron Works, Philadelphia, Pa.  
 Berlin Constr. Co., Berlin, Conn.  
 Bethlehem Steel Co., Bethlehem, Pa.  
 Boston Bridge Works, Boston, Mass.  
 Central States Bridge Co., Indianapolis, Ind.  
 Champion Bridge Co., Wilmington, O.  
 Chesapeake Iron Works, Baltimore, Md.  
 Chicago Bridge & Iron Works, Chicago, Ill.  
 Clinton Bridge Wks., Clinton, Iowa.  
 Eastern Bridge & Struc. Co., Worcester, Mass.  
 Flour City Orn. Iron Co., Minneapolis, Minn.  
 Fort Pitt Bridge Works, Pittsburgh, Pa.  
 Ingalls Iron Works Co., Birmingham, Ala.  
 Inter. Steel & Iron Co., Evansville, Ind.  
 Lewis-Hall Iron Wks., Detroit, Mich.  
 Louisville Bridge & Iron Co., Louisville, Ky.  
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 Missouri V'y. Edge & Iron Co., Leavenworth, Kan.  
 Morava Constr. Co., Chicago, Ill.  
 Mt. Vernon Bridge Co., Mt. Vernon, Ohio.  
 Penn. Bridge Co., Beaver Falls, Pa.

\* Indicates that the manufacturer carries an advertisement. See index facing inside back cover.

# EASTON



## ROLL-OVER BODY

### **The Perfect Balance Automatic Dumping and Righting---Is a Great Time Saving Feature**

THE EASTON ROLL-OVER BODY is tripped from the seat by the driver. It is so perfectly balanced that gravity rolls it right over into a completely dumped position and then, relieved of its load, it rolls back and automatically locks in a loading position.

This feature is exclusive with the Easton Roll-Over and cannot be obtained in any other body. Standard size bodies are carried in stock at Easton, Pa., and will be attached to trucks, driven to the works, without extra charge.

**Time means money to the road builder or contractor, and he should buy his equipment on a time-saving basis.**

**Write for bulletin No. 33—also bulletin No. 32, describing special Scoop Body for Ford trucks only.**

**EASTON CAR AND CONSTRUCTION CO.  
EASTON, PENNA.**

## Where to Purchase

7

Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.  
Richmond Struc. Steel Co., Richmond, Va.  
Riverside Bridge Co., Martins Ferry, O.  
Virginia Bridge & Iron Co., Roanoke, Va.  
Wisc. Bridge & Iron Co., North Milwaukee, Wis.

### BRONZE TABLETS

Flour City Orn. Iron Co., Minneapolis, Minn.  
Imperial Brass Mfg. Co., Chicago, Ill.  
Mott Iron Wks., J. L., New York.

### BROOMS (See Street Sweeping Brooms)

### BUCKETS, AUTOMATIC DUMPING

\*Littleford Bros., Cincinnati, O.  
Lakewood Engineering Co., Cleveland, O.  
Stuebner Iron Works, G. L., L. I. City, N. Y.

### BUCKETS, CLAM SHELL

\*Blaw-Knox Co., Pittsburgh, Pa.  
\*Haisz Mfg. Co., Geo. New York.  
Brown Hoisting Mch. Co., Cleveland, O.  
Browning Co., Cleveland, O.  
Byers Mach. Co., J. F., Ravenna, O.  
Coleman Co., F. A., Cleveland, O.  
Hayward Co., New York.  
Industrial Works, Bay City, Mich.  
Kiesler Co., J. F., Chicago, Ill.  
Lakewood Engineering Co., Cleveland, O.  
Link-Belt Co., Chicago, Ill.  
Mead-Morrison Mfg. Co., E. Boston, Mass.  
Orton & Steinbrenner Co., Chicago, Ill.  
Owen Bucket Co., Cleveland, Ohio.  
Williams Co., G. H., Erie, Pa.

### BUCKETS, CONCRETE

\*Koppel Ind. Car & Equip. Co., Koppel, Pa.  
\*Ransome Concrete Mch. Co., Dunellen, N. J.  
Insley Mfg. Co., Indianapolis, Ind.  
Lakewood Engineering Co., Cleveland, O.  
Smith Co., T. L., Milwaukee, Wis.  
Union Iron Works, Inc., Hoboken, N. J.  
Weller Mfg. Co., Chicago, Ill.

### BUCKETS, DRAGLINE

\*Green, L. P., Chicago, Ill.  
\*Sauerman Bros., Chicago, Ill.  
Austin Machinery Corp'n, Toledo, O.  
Brown Hoisting Mach. Co., Cleveland, O.  
Bucyrus Co., So. Milwaukee, Wis.  
Dobbie Fdry. & Mach. Co., Niagara Falls, N. Y.  
Hayward Co., New York.  
Industrial Works, Bay City, Mich.  
Link-Belt Co., Chicago, Ill.  
Monighan Machine Co., Chicago, Ill.

### BUCKETS, DREDGING AND EXCAVATING

\*Blaw-Knox Co., Pittsburgh, Pa.  
\*Haisz Mfg. Co., Geo., New York.  
Brown Hoisting Mach. Co., Cleveland, O.  
Browning Co., Cleveland, O.  
Hayward Co., New York.  
Kiesler Co., J. F., Chicago, Ill.  
Lakewood Eng. Co., Cleveland, O.  
Mead-Morrison Mfg. Co., East Boston, Mass.  
Owen Bucket Co., Cleveland, Ohio.  
Williams Co., G. H., Erie, Pa.

### BUCKETS, ORANGE PEEL

Hayward Co., New York.  
Industrial Works, Bay City, Mich.  
Kiesler Co., J. F., Chicago, Ill.  
McMyler Interstate Co., Cleveland, O.  
Mead-Morrison Mfg. Co., East Boston, Mass.  
Orton & Steinbrenner Co., Chicago, Ill.  
Vulcan Iron Works, Jersey City, N. J.

### BUILDERS' HARDWARE

Corbin, P. & F., New Britain, Conn.  
Reading Hardware Co., Reading, Pa.  
Russell & Erwin Mfg. Co., New Britain, Conn.  
Sargent & Co., New Haven, Conn.  
Stanley Works, New Britain, Conn.  
Yale & Towne Mfg. Co., New York.

### BUILDINGS, STEEL (See Bridges and Buildings)

### BUNKS AND COTS

Fort Pitt Bedding Co., Pittsburgh, Pa.

\* Indicates that the manufacturer carries an advertisement. See index facing inside back cover.

Haggard & Marcussen Co., Chicago, Ill.  
Southern Rome Co., Baltimore, Md.

### CABLES (See Wire and Cables)

### CABLEWAYS

\*Green, L. P., Chicago, Ill.  
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Flory Mfg. Co., S., Bangor, Pa.  
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Waterbury Co., New York.

### CAISSONS

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Birmingham Tank Co., Birmingham, Ala.  
Foundation Co., New York.  
Bethlehem Steel Co., Bethlehem, Pa.  
O'Rourke Eng. Constr. Co., New York.  
Petroleum Iron Works Co., Sharon, Pa.

### CALCIUM CHLORIDE FOR ROADS

\*Dow Chemical Co., Midland, Mich.  
\*Solvay Process Co., Syracuse, N. Y.  
Carbide Calcium Co., Carbondale, Pa.

### CALCULATING MACHINES

Burroughs Adding Machine Co., Detroit, Mich.  
Dalton Adding Mach. Co., Cincinnati, O.  
Felt & Tarrant Mfg. Co., Chicago, Ill.  
Marchant Calc. Machine Co., Oakland, Cal.  
Monroe Calculating Machine Co., Orange, N. J.

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Rochester Can Co., Rochester, N. Y.  
Solar-Sturges Mfg. Co., Chicago, Ill.  
Steel Basket Co., Cedar Rapids, Iowa.

### CARS, INDUSTRIAL V. DUMPING

\*Easton Car & Constr. Co., Easton, Pa.  
\*Insley Mfg. Co., Indianapolis, Ind.  
\*Koppel Ind. Car & Equip. Co., Koppel, Pa.  
Atlas Car & Mfg. Co., Cleveland, O.  
Austin Machinery Corp'n, Toledo, O.  
Chase Fdry. & Mfg. Co., Columbus, O.  
Hunt Co., C. W., W. New Brighton, N. Y.  
Lakewood Engineering Co., Cleveland, O.  
Stuebner Iron Works, G. L., L. I. City, N. Y.  
United Iron Works, Kansas City, Mo.  
Weller Mfg. Co., Chicago, Ill.  
Whiting Corp., Harvey, Ill.

### CARTS, CONCRETE

\*Insley Mfg. Co., Indianapolis, Ind.  
\*Littleford Bros., Cincinnati, O.  
\*Ransome Concrete Mch. Co., Dunellen, N. J.  
Akron Barrow Co., Cleveland, Ohio.  
Etnyre & Co., E. D., Oregon, Ill.  
Gray Iron Fdry. Co., Reading, Pa.  
Lakewood Engineering Co., Cleveland, O.  
Lee Trailer & Body Co., Chicago, Ill.  
Smith Co., T. L., Milwaukee, Wis.  
Sterling Wheelbarrow Co., Milwaukee, Wis.  
Toledo Wheelbarrow Co., Toledo, Ohio.

### CAST IRON PIPE (See Pipe, Cast Iron)

### CASTINGS, STREET AND SEWER

\*Burch Plow Wks. Co., Crestline, Ohio.  
\*Central Foundry Co., New York.  
\*Clark Co., H. W., Mattoon, Ill.  
\*U. S. Cast Iron Pipe & Fdry. Co., Burlington, N. J.  
Canton Foundry & Machine Co., Canton, O.  
Casey-Hedges Co., Chattanooga, Tenn.  
Clow & Sons, J. B., Chicago, Ill.  
Dee Co., W. E., Chicago, Ill.  
Elkhart Fdry. & Mach. Co., Elkhart, Ind.  
Foundry Mfg. Co., St. Albans, Vt.  
Gilbert Mfg. Co., Aberdeen, S. Dak.  
Klaner Mfg. Co., Dubuque, Iowa.  
Madison Foundry Co., Cleveland, O.  
Pechstein Iron Works, Keokuk, Ia.





## IMMEDIATE DELIVERY

### For That Trench Digging Job

Right now you can be sure of immediate shipment of P & H Trench Excavators—and be ready to tackle your trench digging jobs with least amount of wasted time.

And once on the job the P & H will do its share in making the dirt fly.

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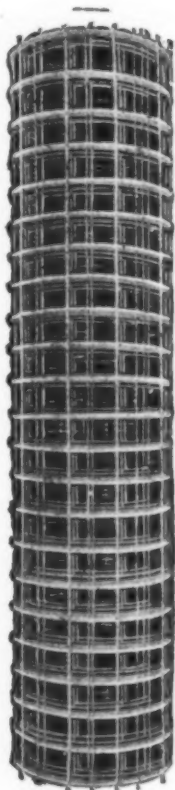
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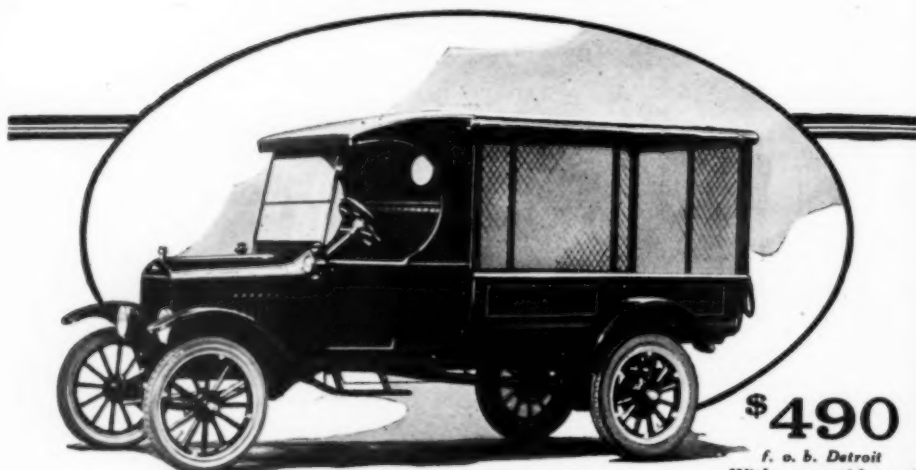
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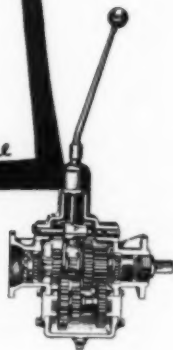
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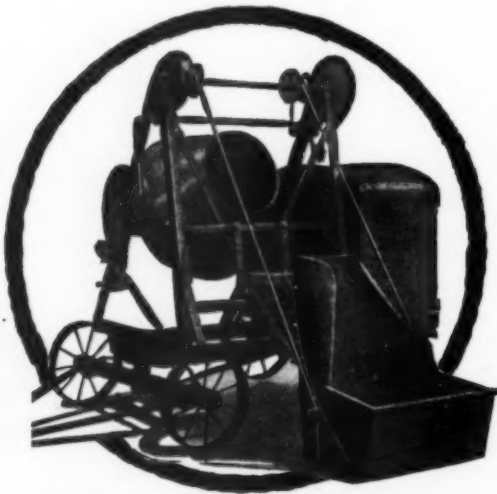
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Left—Thousands of tons of Kyrock stored for summer shipment.

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The mineral aggregate is a pure silica sand, sharp and angular, and so hard it cuts like a diamond. There are many rock asphalt deposits in Kentucky some of them of little value because of inferior aggregate or bitumen. Kyrock comes from the same deposits from which was produced the rock asphalt used in the Camp Knox Road and other famous rock asphalt pavements.

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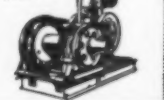
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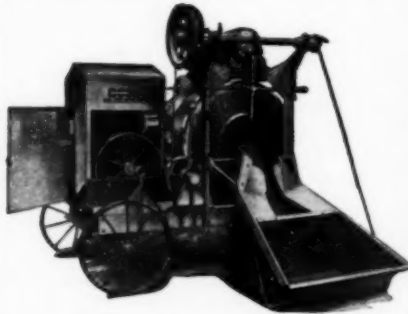
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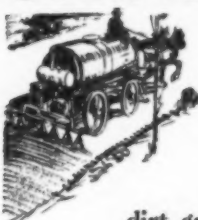
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Has your town or county failed to adopt a really constructive road building program because of the belief, which is widespread, though erroneous, that such an undertaking would require a great outlay of money?

If it has, you should investigate the costs of treating your dirt, gravel and stone roads with Standard Asphalt Road Oil. It will make excellent roads for you at a comparatively small cost. No special equipment is required to apply it. The old roads are simply brought to the proper gradient and drained, after which Standard Asphalt Road Oil is applied. It will provide a surface capable of withstanding the heaviest traffic to which such a road ordinarily would be subjected.

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*At your request, we shall be pleased to send you our booklets relating to the betterment and permanent improvement of roads through the use of Standard Asphalt Road Oil and Stanolind Paving Asphalt.*

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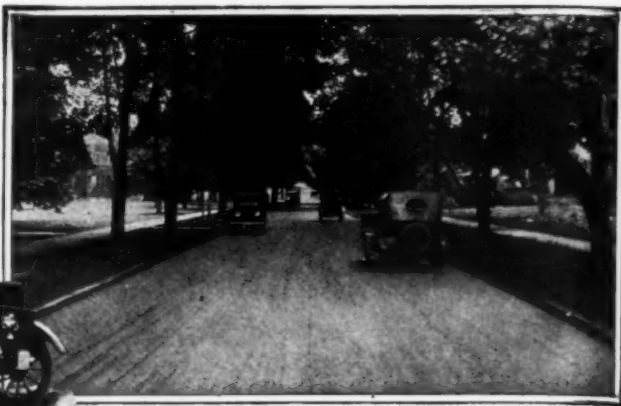
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Grove Street, Sewickley, Pa.,  
Tarvia-built 1911. Picture  
shows the perfect condition  
of the street today—after  
13 years of grinding traffic.



## This car was modern in 1911 —the street still is

"HORSELESS carriages" we called them. Funny-looking contraptions, weren't they? Look at our picture. That top! That awkward rumble seat! Cars like this disturbed the peace and quiet of Sewickley, Pa., back in 1911—the year when Grove Street was Tarvia-built.

Thirteen years ago! Yet this Tarvia-built street is still in perfect condition in spite of years of traffic.

Tarvia streets can be maintained indefinitely at little cost—only economical maintenance is needed to

make a Tarvia pavement last indefinitely. And in addition:

A Tarvia pavement will not wave, roll or rut.

A Tarvia pavement will remain skidproof because of its granular surface.

Thousands of Tarvia streets and roads have proved to taxpayers that—for the money spent—Tarvia gives more miles and the most years of satisfactory highway service. Every paving requirement—construction, repair or maintenance—can be met with Tarvia.

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For Road Construction  
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The *Barrett* Company

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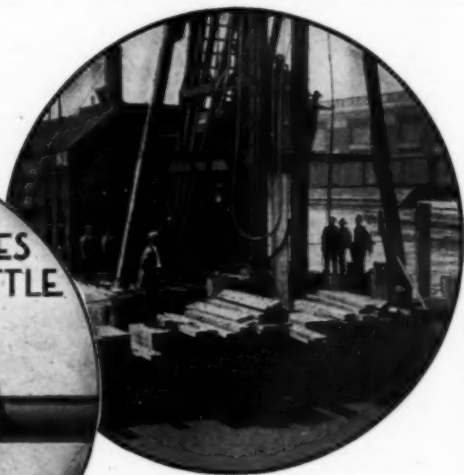
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# For Concrete Pile Driving

*Throttle*

*Control*



*of Every  
BLOW!*

**You get it with**

## **McKiernan-Terry Hammers** 9-B and 11-B Double Acting

At last it is possible to use heavy pile hammers to drive concrete piles—or heavy timber piles—when prevailing conditions seem to indicate loading and jetting as the only method possible.

The throttle control of the blows of McKiernan-Terry 9-B and 11-B concrete Pile driving Hammers permits exact regulation of the velocity, energy and frequency of the blows!

The fact is, the throttle control made possible by these Hammers permits exact regulation of the blow for any size and type of concrete pile and soil resistance.

A touch of the operator's hand on the

throttle, and the steam accelerated ram of these big hammers can be made to merely tap-tap on the pile head.

—or to deliver from 120 to 140 blows a minute using the entire force of the 1250 lb. and 3625 lb. rams.

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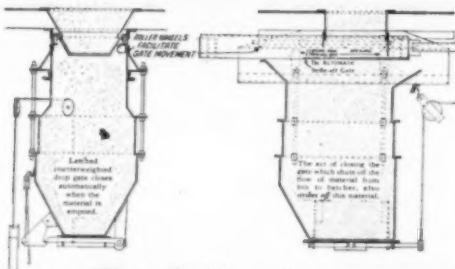
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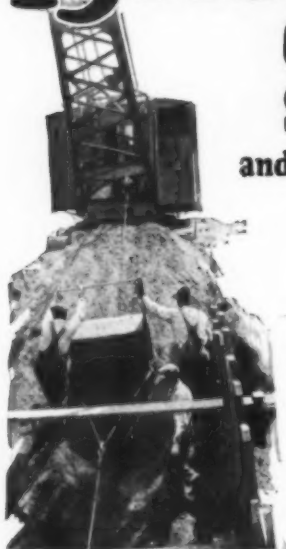
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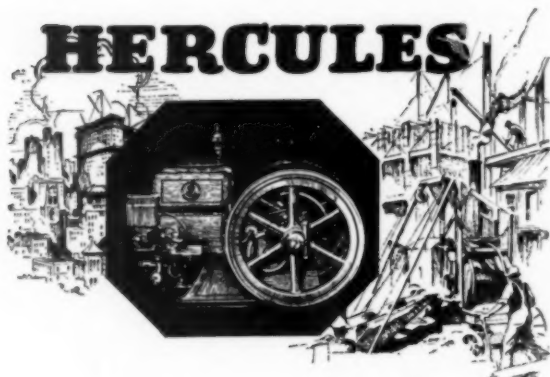
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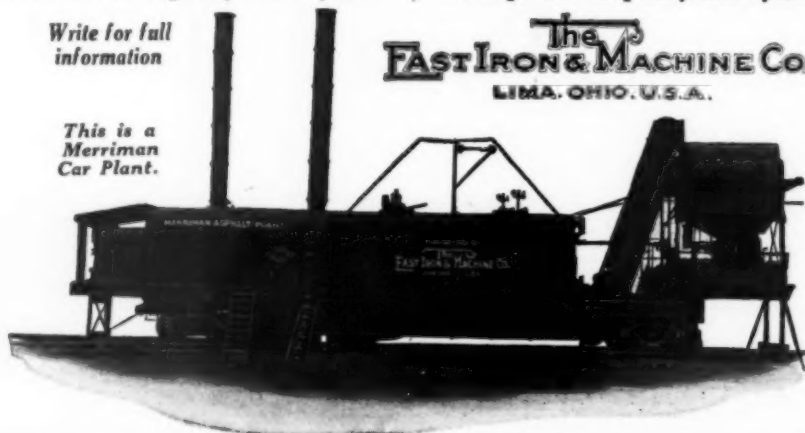
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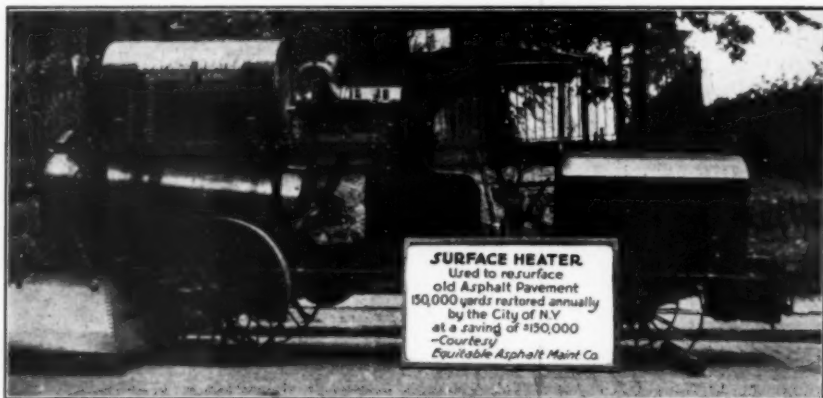
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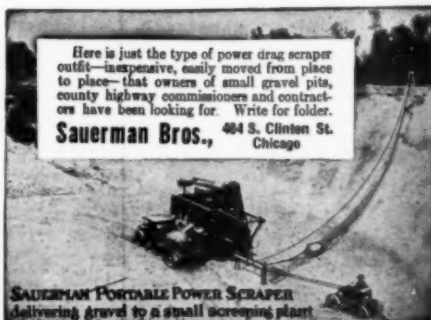
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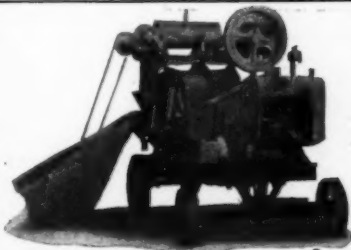
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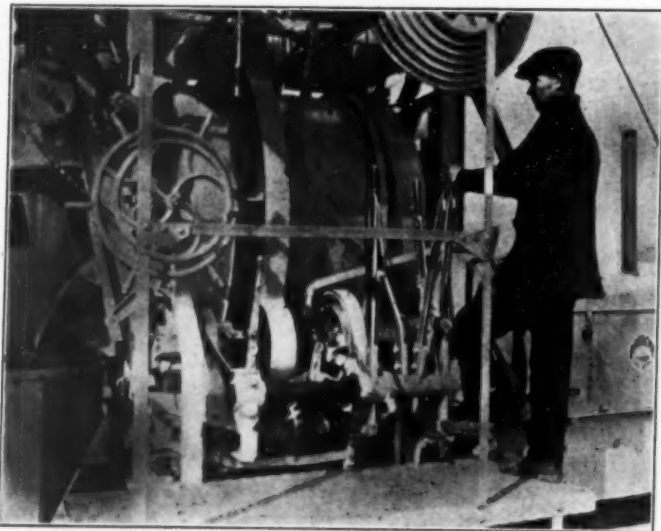
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## Building the Concrete Viaduct on Jamaica Bay Boulevard

This \$3,000,000 Causeway for Heavy Automobile Traffic Has a Roadway from 36 to 72 Feet Wide

By Frank W. Skinner

Consulting Engineer, New York City

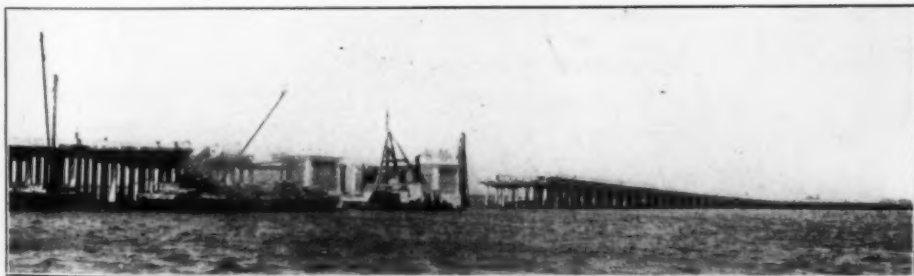
THE Jamaica Bay Boulevard, now under construction by the Borough of Queens, New York City, to provide a direct and capacious highway to Rockaway Beach, decreases the length of the present drive from New York and the boroughs of Brooklyn and Queens about 10 miles and  $6\frac{1}{2}$  miles, respectively.

The structure is unique on the Atlantic coast for the great length of the concrete piles driven, for some of the construction details, and for the extreme accuracy required. New and powerful plant had to be designed and built for this special work, large quantities of material were provided, special operations were developed, and remarkable rapidity was achieved. It is believed that the speed attained is unprecedented for this kind of work. The record of intricate form work and concreting and of driving a great footage of very long piles in hard ground is the more impressive on account of the unforeseen conditions and unusual requirements that were met.

The Boulevard extends south from Woodhaven Boulevard approximately  $5\frac{3}{4}$  miles across the

shallow waters of Jamaica Bay to Rockaway Beach at Hollands. A wide causeway section of it crosses tidal flats and low marshy ground where the surface of the deep mud and sand has a maximum elevation less than 6 feet above mean low-water level, and is protected from severe storms, and much of it is submerged by the 5-foot tides with little current. The wide causeway is constructed of several separate sand embankments aggregating about  $4\frac{1}{2}$  miles in length and connected by concrete trestle viaducts in water up to 35 feet deep, supplemented by plate girder drawbridges of 100-foot span over two of the main navigation channels. Much of the location is level, with maximum grades of 3 per cent to secure necessary elevation for the bridges, and the alignment consists of long tangents connected by long-radius curves.

Sections aggregating nearly  $2\frac{1}{2}$  miles near both ends of the Boulevard are under construction by private enterprise, and the remainder, 25,000 feet long, including 19,500 feet of fill and 5,500 feet of concrete trestle, is being built for the city on



GENERAL VIEW OF VIADUCT SECTION OF JAMAICA BAY BOULEVARD, SHOWING FLOATING CONCRETE EQUIPMENT AND CONCRETE PIERS FOR BASCULE SPAN



a unit price contract and will cost about \$3,000,000.

The contract, at an estimated cost of \$2,863,280.14, was originally awarded to Smith, Hauser & McIsaac, Inc., October 31, 1921, and on October 1, 1922, was assigned to Patrick McGovern, Inc. It is now about 90 per cent completed.

#### Causeway, Viaduct and Bulkhead

The shallow-water causeway was made with an hydraulic fill of 21 feet maximum depth and about 350 feet maximum width; the base, which, in some places, was deposited directly on the original bottom, and in other places was deposited after the soft mud had been dredged, exposing the hard bottom. About 1,500 lineal feet of the fill is protected by a wooden pile bulkhead; the remainder is built with a natural slope of 1 vertical to 20 horizontal on each side of the central traffic portion 100 feet wide, that consists of a 60-foot paved roadway and 40-foot shoulders on a cinder fill 4 inches thick.

The concrete viaduct consists of a floor slab, beams and girders supported on transverse bents of precast reinforced concrete piles. The spans have a practically uniform length of 24 feet on centers, and the structure will eventually be 100 feet wide from out to out of parapets. About 2,600 lineal feet is being initially constructed of the full width with an over-all width of 52 feet, supported on 7 piles per bent, but will eventually be increased to full width.

The bulkhead consists of a continuous wall of wooden Wakefield sheet piles, 6 inches thick, bolted between double lines of 8- x 12-inch top and bottom wales. A row of vertical staggered piles 5 feet apart is driven on each side of the wales and bolted to them, and alternate piles in the outer row are secured to pairs of inclined anchor piles by 1½-inch inclined screw-end tie-rods.

According to the depth of the water, the sheet-

ing is in 18-foot, 24-foot, and 28-foot lengths, and the vertical piles are in 26-foot, 30-foot, and 36-foot lengths. All of the timber is creosoted long-leaf yellow pine, and all of the steel bolts and tie-rods are galvanized.

#### Concrete Cast Piles

There are 2,194 24- x 24-inch piles from 50 to 100 feet in length that are used for the regular transverse bents of the viaduct. All were made with 1:1:2 concrete and were seasoned sixty days before driving. The piles contain 0.148 yards of concrete and 36.76 pounds of ½-inch round and 1¼-inch square reinforcement steel per lineal foot and weigh 600 pounds per lineal foot.

A careful study was made of the effect of sea water on submerged concrete, and special precautions were taken by providing a minimum thickness of 3¼ inches of concrete outside of the reinforcement bars, and by jacketing the tops of the piles from 2 feet below low-water level to 3 feet above high-water level with a solid casing of two thicknesses of 2-inch creosoted planks secured by horizontal galvanized iron ties 3 feet apart vertically. The bottoms of the piles were beveled to a blunt point, and the vertical reinforcement bars projected 2½ feet above the concrete at the upper end to bond with the cast-in-place concrete of the slab and girders.

#### Floor Platform

Each pile bent is capped with a transverse girder, 80 inches high, 12 inches thick, 44 feet 3 inches or 92 feet 3 inches in length, exclusive of end sidewalk brackets. The transverse girders are cast integral with the longitudinal girders, are in the planes of the piles, and are monolithic with the roadway floor slabs 11 inches thick. Under the 12-foot sidewalk there is a continuous duct chamber 38½ inches deep and 70 inches wide, covered by removable concrete slabs 6 inches thick. On the other side of the roadway there are continuous depressions 12 inches deep and 1½ feet wide, adjacent to the curb, that is filled with cinders and covered with 5-inch concrete protection slabs, which may be removed at any future time to permit laying a trolley track on the cinder fill.

At every third bent there is a regular expansion joint, 2 inches wide, transverse to the roadway slab.

The expansion ends of the longitudinal girders have steel bearing plates with transverse angles riveted to their upper sides to bond with the concrete in the beam. The lower side engages a pair of segmental steel rollers seated on a similar bearing plate in a pocket in the transverse girder. Spurs on the roller frame engage recesses in the top and bottom plates and limit the displacement of the rollers.

The sidewalk fences are made with solid precast reinforced concrete panels 5½ inches thick, which at each end engage horizontal dowel-rods cast into the fence posts, and are free to slide in the panels.

#### Beach Channel Abutment

At the south end of the boulevard the pile viaduct crosses Beach Channel and terminates, at the bulkhead line, with a 30- x 104-foot abutment having a 2-foot reinforced concrete floor slab with the upper surface 3 feet below low-tide level, that is supported on 102 24-inch concrete



DERRICK WITH SPREADER TRUSS AND SPECIAL LIFTING CLAMP HANDLING LONG CONCRETE PILES IN SEASONING YARD





#### REINFORCED CONCRETE PILES DRIVEN TO POSITION

These piles, measuring 24 x 24 inches, are driven to exact position and elevation by quadruple water jets supplemented by a steam hammer. They are driven with parallel faces to a penetration of 30 feet in fine, hard sand

piles up to 63 feet in length. Three sides of the platform are enclosed by the transverse face wall and the two longitudinal side walls that also serve as retaining walls for the earth fill.

The concrete pile tops extend 7 inches above the lower surface of the floor slab, and during its construction, supported the latter on permanent 3-inch form planks resting on pairs of wales bolted to the piles. Just under the transverse wall the concrete piles are braced by inclined wooden piles.

Adjacent to the channel the abutment is enclosed on three sides by a solid wall of 16- x 18-inch reinforced concrete sheet piles about 42 feet long, with 6- x 6-inch triangular tongue-and-groove installation joints. The abutment contains 5,763 lineal feet of concrete piles, 3,444 feet of concrete sheet piles, 3,080 feet of timber piles, 520 yards of concrete, and 7,376 feet, board measure, of timber.

#### Causeway Construction

The 1,000,000 yards of fill required for the embankment were provided by hydraulic dredges that handled from 6,000 to 14,000 yards of sand daily. The sand was delivered through a maximum length of 2,500 feet of pipe, and to a maximum height of 10 feet above water-level. The pipe, in 20-foot lengths, was connected by flange and gasket joints when it was supported on temporary pile trestles, and with spherical joints, 90 feet apart, where it was carried on pontoons. The dredge was operated by a force of about 25 men, including those handling the discharge pipe. The highest record made was 275,000 yards in one month. The dredges were operated to a depth of about 9 feet, and besides providing 1,000,000 yards of sand for the embankment, furnished 450,000 yards for fill behind the permanent wooden bulkhead, thus reclaiming about 20 acres of land along the water-front.

An important feature of the standard methods

and equipment for this work, and one that was developed to give great continuous efficiency, was the installation for producing the 56,000 yards of concrete of uniformly high quality at a sustained rapid rate by the use of only two Rex mixers, a stationary one on land for the precast piles, and a movable one installed on a scow from which the concrete was spouted to abutments, girders and floor slabs.

#### Precasting Long Piles

The 24- x 24-inch concrete piles were made one part cement, one part sand, and two parts stone of a maximum size of  $\frac{3}{4}$ -inch, mixed for not less than 90 seconds in a 1-yard Rex machine with a carefully proportioned amount of water not exceeding 45 gallons per yard. Daily tests of concrete, taken from the mixer, showed not more than 6 inches slump in a 16-inch test cylinder. The vertical reinforcement bars were attached to horizontal  $\frac{1}{4}$ - bands, spaced 6 inches apart from the top of the pile to points from 26 to 35 feet below it, and 12 inches apart beyond this point.

The piles were proportioned for a dead load of 25 tons, a live load of 15 tons, and an impact of 8 tons. There were required in all 2,296 piles, which have all been pre-cast and driven.

The pile yard was a level space, about 200 feet wide and 400 feet long, which was commanded by a stiff-leg steel derrick with 90-foot boom, traveling on two longitudinal standard-gage tracks 40 feet apart on centers.

Sand and gravel were shipped to the yard in barges that were unloaded by 1-yard and 1½-yard Hayward clam-shell buckets serving elevated storage hoppers for the land and floating concrete plants. The land hoppers delivered by gravity to the 23-S new model Rex mixer with batch hopper, power-operated discharge, and automatic water-tank. This mixer delivered concrete to about 14 Keystone 2-wheel carts that ran on removable

6- x 12-foot panels of wooden flooring laid on top of the concrete forms and shifted as the latter were filled.

The casting floor was made of 2-inch planks spiked to carefully leveled sills, and serving as a continuous bottom for the forms. The sides of the forms were made of wooden panels 20 feet long, with 4- x 4-inch vertical cleats 2 feet apart on centers that had short sections of horizontal angles at the bottom which were nailed to the floor, thus keeping them properly spaced and aligned. The tops of the forms were held rigidly by horizontal transverse spacing boards 10 feet apart.

The reinforcement steel was bent in a Kardong machine operated by a 3-horse-power General Electric motor, and the rods were assembled and wired together, making, for each pile, complete units which were suspended on spacers that elevated them  $3\frac{1}{4}$  inches away from both sides of the form while the concrete was poured and tamped around them.

The yard had a capacity for about 125 forms, and the output of the mixer was about 300 yards in one 9-hour shift. An average of about 20 piles per day were cast, and after four days were stripped and allowed to season for one month before being stored in tiers, where they remained for at least 60 days before driving.

About 100 piles, 93 to 100 feet long, were required, and were pre-cast 90 feet long and built up to the required length in situ. These piles were driven in water 35 feet deep with their tops at elevation 26, thus giving them a penetration of about 40 feet.

In the storage yard the piles were piled three or four tiers high, separated by thin, transverse wooden strips 10 to 12 feet apart. When handled to and from storage and for driving, the piles were supported at three or more points, the distances between supports being arranged so that the overhanging parts were in no case more than one-half as long as the intermediate parts.

Adjacent to the pile casting floor the contractor established a large general storage and working yard with shops for building and repairing equipment, making forms, bending and assembling reinforcement steel and for miscellaneous service, employing about 100 men, including those at the concrete pile plant. The principal equipment installed or stored here included four derricks with Lambert hoisting engines and one swinging engine, six Ingersoll-Sargent jackhammer drills and one Leyner drill sharpener, one Schramm portable air compressor, one cement bag elevator, the usual carpenter and smith shop appliances and machine-shop tools for repair work.

#### Pile-Driving

All the piles penetrate deeply in the firm, dense sand strata, the frictional resistance alone of which was estimated at 400 pounds per square foot of vertical pile surface, and was relied on, with a proper factor of safety, to carry the live load, dead load being assumed to be carried by the direct end bearing.

The character of the bottom; great weight of piles, a maximum of more than 30 tons; the necessity of handling piles so carefully and accurately as not to develop injurious bending stresses; the great length of piles requiring unusual equipment; the heavy driving and the requirements that the piles must be exactly spaced in both directions, accurately centered, must have

their faces exactly in the planes of the faces of the transverse floor beams and must have their tops driven to accurate elevation with cut-off, made the driving extraordinarily difficult.

The driving equipment at first installed was neither large enough nor powerful enough, and, after the assignment of the contract, was replaced by heavy special plant designed by the contractor and built in 60 days at a cost of about \$75,000 plus \$75,000 of other improvements and extensions to the original contractors' \$320,000 plant, increasing the total outlay for plant alone to \$470,000. The different items of this equipment were selected from the heaviest and best standard and special equipment, purchased separately and combined in the development of a complete driving rig.

A 1,000-ton derrick boat was fitted with heavily braced wooden leads 80 feet high, served by an 80-foot derrick boom of 50 tons capacity operated by a Lidgerwood hoisting engine with a four-lever quadrant rack. Another Lidgerwood hoisting engine with a four-lever quadrant neck was installed to handle the piles and jet pipes in the leads and to operate capstan heads for various lines. The derrick boat and the service boat alongside with a 750-horse-power battery of steam boilers were equipped with a 6-inch, 4-stage, Allis-Chalmers centrifugal jetting pump driven by a 220-horse-power Terry steam turbine to furnish continuously, while each pile was sinking from 20 to 60 feet, four large high-pressure hydraulic jets that excavated holes below the pile points. There were also one 6- x 12- x 8-inch Blake and Knowles and two large Worthington steam pumps, two 60-ton and three 15-ton Watson-Stillman hydraulic jacks, two Albany and two 50-ton Norton jacks.

The boat was moored in position by five anchor lines on power windlasses that enabled it to be quickly shifted, adjusted and securely held in approximately the position required to spot the pile. The boats were manned by a crew of 22 men who had quarters on the service boat.

#### Handling and Transporting Piles

For handling by the large traveler at the casting yard the piles were suspended from the stiff, horizontal bottom chord of a spreader truss about 60 feet long and 20 feet deep, which was attached to the hoisting tackle of the derrick boom. Four suspended grips, movable on the flanges of the lower chord of this truss, were set at the exact distances required for different length piles.

The piles were transported from the casting yard a maximum distance of 15 miles to the pile-driver on decked scows carrying 14 or more piles at each trip. They were transferred from the scow to the pile-driver by a derrick, with its hoisting tackle provided with a 60-foot steel spreader truss, to the horizontal bottom flange of which the piles were lashed in three or four places.

#### Driving the Very Long and Heavy Piles

Before the pile was set in the leads, a special steel cap (provided by the Deline Engineering Company, who built the spreader trusses and other steel fittings) and two 3-inch steel hydraulic jet pipes that reached to the point of the pile, were set in place and secured by an automatically detachable steel clamp. These pipes were arranged one in the center of each side of the pile, and their lower ends were reduced to  $1\frac{1}{2}$ -inch noz-

zles, through which 150-pound jets were maintained by pressure from a 6-inch main connected to the 3-phase centrifugal pump operated by the steam turbine on the derrick boat. The 80-foot boom of the pile-driver boat derrick assisted in handling the piles and revolving them to a vertical position in the leads, where they were engaged at deck level between a pair of horizontal dogs having a 4-foot back-and-forth movement controlled by a windlass. The piles were accurately located by transverse measurements and by longitudinal spacing from a guide-wire stretched between the 2-foot projections of horizontal wooden bars clamped to the end piles of each bent. The adjustments permitted the pile to be quickly moved 10 inches in any direction at the top, making its location practically exact.

The piles were driven to an average penetration of about 30 to 40 feet in 10 or 15 minutes by the action of the hydraulic jets alone. The jetting ceased when the pile top was a short distance above the required elevation, after which the jet pipes were removed. In driving the piles, a spacer or follower was used that enclosed and protected the projecting reinforcement bars and received the impact from a No. 11B McKiernan-Terry double-action steam hammer, weighing about 13,000 pounds, which drove the piles 1 or 2 feet farther to refusal, so that the tops did not require cutting off. Generally, one week was allowed to elapse after the piles were jetted before they were driven by the steam hammer to the required penetration. A test load of 75 tons was applied to one of these piles one month after it had originally been jetted down. This test load in 3 days caused a settlement of 3 3/4 inches, which at the end of the tenth day had not increased. The steam hammer was then applied and a further penetration of 4 inches to final refusal was obtained.

After some of the piles, driven by the original contractor, had been installed 12 months, they were tested by 150 blows of the 3,600-pound moving part of the 13,000-pound McKiernan-Terry hammer, striking 110 blows per minute, which brought them to refusal after an additional penetration of 6 inches. A maximum of 24 70- to 90-foot piles per 8-hour day were driven by a force of 22 men on the pile driver, coal barge and supply boats alongside. The best monthly record was driving 24,000 linear feet of piles in twenty 8-hour days.

#### Concreting the Superstructure

Pairs of temporary cross-pieces were clamped to the tops of the pile bents and supported the wooden forms for the girders and floor slabs. The girder reinforcement bars were bent, assembled and wired to form complete units at the contractor's yard. They were carefully set in position, secured at the proper distance from the surface of the concrete and the slab reinforcement put in position and wired. The spans were then successively concreted from the floating plant moored alongside. The sidewalk posts are cast in place, engaging dowels that pro-

ject from the floor slab. Later the panels are to be cast between the posts, completing the regular viaduct structure.

On the 40- x 80-foot wooden scow for the floating plant there was installed another 23-S 1 1/2-yard Rex mixer with engine and automatic water-tank. It was fed by gravity from a 10-yard storage hopper that is filled by a Hayward clam-shell bucket operated from the derrick that unloaded adjacent sand, gravel and cement boats. The concrete boat was equipped with an Insley steel hoisting tower 60 feet high, from which the concrete was spouted through steel chutes, supported by a steel tower boom and a balanced counterweight truss, and having a maximum radius of 72 feet.

This plant was operated by a force of 43 men to place all the concrete above the pile tops. Each 72-foot regular section of floor slab and girders between expansion joints contained about 440 yards of concrete, 60 tons of reinforcement steel, bent, assembled, wired and securely fastened in position, many of the bars being wire-spliced. About 4 feet board measure of lumber was required for each linear foot of form, about 1 1/2 feet of it being new lumber for each form, thus indicating about 1 1/2 times re-use. Each 72-foot section was concreted in one 14-hour continuous operation, and the monthly output of concrete placed in the viaduct floor was about 3,000 yards.

The construction of the Boulevard commenced in November, 1921, and was about 5 per cent completed October 1, 1922, and 80 per cent completed October 1, 1923, and it is expected will be ready for traffic in July.

The principal quantities include about 14,300 yards of 1:1:3 concrete in the floor and sidewalks, 15,000 yards of 1:1:2 concrete in the beams and girders, 4,500 yards of 1:1:3 concrete in the abutments, 22,200 yards of 1:1:2 concrete in 150,000 lineal feet of 24- x 24-inch piles, 4,500 tons of reinforcing steel, exclusive of that in piles, 953,000 yards of embankment of excess of excavation, 28,000 cubic yards of steam cinders, 35,000 lineal feet of creosoted piles in bulkhead,



FLOATING PLANT CONCRETING FLOOR GIRDERS AND SLAB ON PRECAST CONCRETE PILE BENTS

32,000 lineal feet of creosoted timber piles, 300,000 feet, board measure, of timber sheeting in the bulkhead, 2,800 yards of abutment riprap, 3,400 yards of paving riprap, and 1,000,000 feet, board measure, of creosoted pile protection.

The principal items of construction plant also included two steel dump buckets, two steel scale boxes and five battleship buckets, one cement bag elevator, a General Electric steam generator with

field rheostat, one 18 x 35-foot barge, two gasoline launches, one 35-ton towing steamer, and one life-boat.

The work has been executed with a total force of about 500 men, by Patrick McGovern, Inc., 50 East 42nd Street, New York, under the direction of Captain James Rice, in charge of engineering construction, borough of Queens, and C. T. Steiner, assistant engineer.

## Highway Department Speeds Up Lettings

Quick Awarding of Contracts, and Payment for Materials Stored on the Job, Helpful to Contractors

CONTRACTORS from the Middle West, New England and the Atlantic seaboard states have been attracted to Pennsylvania during the last two or three months in the hope of securing contracts for Pennsylvania road construction. So far in 1924, Pennsylvania has awarded the contracts for approximately 130 miles of durable construction. Further "lettings" will be held in the next few months. It is the hope of the Pennsylvania Highway Department to complete 800 miles of modern pavement during the 1924 season; and its aim for 1925 and 1926 is for a still higher figure.

Pennsylvania has been setting a rapid pace among American states. The voters of that state approved a \$50,000,000 bond issue in 1918, and during the following four years the state built approximately 2,200 miles of road into which concrete entered in some form. In 1923, the voters of Pennsylvania again approved a proposition to issue bonds in the sum of \$50,000,000 for road improvement purposes. But this is not all the road-building resources of that state. The automobile license fees are used for replacement and road maintenance. The state takes advantage of Federal Aid. From all sources, the Pennsylvania Highway Department during the four years beginning with 1923 has revenues of \$225,000,000.

### Changes in Concrete Road Specifications

Recently a change was made in the specifications for concrete road sections in Pennsylvania, through which the amount of material entering a road is reduced but the strength and durability of the slab is not affected. The practice of using wire mesh reinforcement has been abandoned, according to *The Nerba*, and longitudinal reinforcement bars are used, there being a longitudinal joint in the center of the slab. The Pennsylvania specifications call for a thickened edge. During the latter part of April, the Department demonstrated the new type for the benefit of contractors who went to Harrisburg; and it also showed them approved methods of building-in the white traffic lines adopted in that state.

When the change in specifications was first announced, it was not immediately reflected in the

bids being received by the Department and there were a great many rejections. The jobs were re-advertised, and on later bids the decreases ranged as high as \$4,200 per mile.

### Speed of Lettings

"Speed" is the watchword of the Pennsylvania Highway Department this season. On bidding days, the contractors assemble in the Hall of the House of Representatives at Harrisburg, where bids are read in public. Although there may be 15 or 20 projects and from 100 to 150 bidders, tabulations are completed and figures checked with the Department's estimates so speedily that at five o'clock the same evening announcement is made of those bids which have been rejected, and notice is given the low bidders, who are summoned to Harrisburg to furnish the Department with proof that they are able financially and otherwise to handle the contract if it is awarded to them. Within a few days final papers are signed and the contractor is directed to make all haste in beginning his operations. Recently an Indiana County contractor was awarded a contract three days after bids were opened, and within three days he had some of his equipment on the ground ready for work.

### Payment for Material Stored on Job

A recent innovation in Pennsylvania, and one which is of immeasurable benefit to the contractor, is the Pennsylvania decision to pay the contractor for material stored on the job. He is allowed 81 per cent of the cost of stored material. Thus encouraged to make early orders for delivery, the Pennsylvania contractor has an "edge" on contractors in other states where payment is not made in this way. The placing of early orders has resulted in an avoidance of rail congestion which might have occurred otherwise.

Contractors from as far west as Chicago, from Boston and other New England points, from New York, New Jersey, Delaware and Maryland, are competing with Pennsylvania contractors for the road construction jobs planned by the Highway Department of the Keystone State.

### Changes in Osgood Organization

THE Osgood Company, manufacturers of excavating machinery, Marion, Ohio, have announced the transfer of N. E. Otterson, of the New York District Sales Office, to the Chicago District Sales Office and his promotion to District Sales Manager in charge of the Chicago district.

### Draper Working on School Development

THE Rutherford County School Board, Rutherfordton, N. C., has retained E. S. Draper, landscape architect and engineer, 11 East 5th Street, Charlotte, N. C., to make a survey and complete plans for the development of the grounds and athletic features that are contemplated for the new high school.



## Legal Points for Contractors

These brief abstracts of court decisions in the contracting fields may aid you in avoiding legal difficulties. Local ordinances or state laws may alter the conditions in your community. If in doubt, consult your own lawyer

**Edited by A. L. H. Street, Attorney-at-Law**

### **Applicability of Compensation Act to Interstate Tunnel Construction**

An action brought to recover damages for death of an employee while working in a tunnel in course of construction under the Hudson River, connecting New Jersey and New York, was dismissed by the New York Supreme Court for Kings County. (*Sullivan vs. Booth & Flinn*, 202 New York Supplement, 807.) The case was dismissed on the theory that the claim was one which should have been made under the New York Workmen's Compensation Act, instead of being sued upon. In support of the suit it was unsuccessfully contended that the work was of such interstate character as to permit the bringing of the suit under the Federal Employers' Liability Act. The Court said, in part and after referring to the fact that the accident occurred between the bulkhead line on the New York side and the middle of the river:

"The land under water between the bulkhead line on the New York side of the Hudson River and the bulkhead line on the New Jersey side of that river is not interstate territory solely under the jurisdiction of the Federal Government."

"At the time of the accident in question the construction of the tunnel had just been begun, and, if it be conceded that the tunnel was to be used when finished as an agency for interstate commerce, the decedent could not be said to be engaged in carrying on interstate commerce at the time of the accident. His status was exactly the same as one engaged in building a railroad or constructing a bridge to be used when completed in interstate commerce. . . . Both could be used as an agency for carrying on interstate commerce when completed, but an employee engaged in constructing the agency is too remotely connected with the act of carrying on such commerce to hold that he would under the assumed cases be so engaged."

### **Contractor's Right to Pay for Extra Work Entailed Through Deception**

Before contracts for constructing a barge canal were awarded by the state, it caused to be made, as required by statute, a full investigation of the nature of materials to be excavated, and furnished what purported to be accurate estimates of excavating costs. The time intervening between the advertising for bids and award thereon did not afford adequate time for a thorough investigation by the successful bidder. It is found that the state's en-

gineers knew that the estimates were false and intended to be deceptive. Under these circumstances, the New York Court of Claims decided in the case of *James Stewart & Co. vs. State*, 201 New York Supplement, 334, that the contractor was entitled to recover from the state the extra expense entailed by reason of encountering hard materials not shown on the plans but known by the state to exist. It was further held that the contractor's rights in this regard were not defeated by reason of a recital in the contract that the contractor's estimates were based on its own investigations and that it would make no claim on account of erroneous estimates or representations by state officers or agents. But the opinion shows that the state is not under the full liability that would apply to private owners, for it says:

"The state cannot be guilty of fraud, nor can an action sounding in tort [one based on commission of a wrong, as distinguished from breach of contract] be maintained against it without its consent, expressed by legislative act. No damages in this case, therefore, for fraud, nor of a punitive nature, can be awarded against the state."

### **Right to Rescind Contract for Delay in Furnishing Plans**

A contractor was not entitled to rescind a contract for doing work on the ground of delay on the part of the owner's engineers in approving the plans to be used, where no notice had been given that the contractor was being prejudiced on account of the delay and no opportunity given for approval of the plans within a reasonable time. It was so held by the Appellate Division of the New York Supreme Court in the case of *McGowan Connolly Co., Inc., vs. Kenny Moran Co., Inc.*, 202 New York Supplement, 513. The Court said:

"Under the terms of the contract, there was no time fixed when the plans had to be approved by the engineers; and if the plaintiff was to rely on the failure to approve the plans, it should have given notice to the engineers, affording them a reasonable time thereafter to approve the plans. In the absence of such a notice that the plaintiff was being prejudiced, there was no right of rescission. *Taylor vs. Gollet*, 208 N. Y. 253, 101 N. E. 867, Ann. Cas. 1914D. 284. The real grievance of the plaintiff was not the delay in the approval of the plans, but that the price of labor and materials had advanced. As late as June 21, 1920, the plaintiff submitted to the

defendant copies of drawings for approval by the engineers without complaint of delay in approving such plans. There does not seem to have been any delay to which the plaintiff objected until the defendant requested the plaintiff to proceed with the work, whereupon the plaintiff informed the defendant that it could not proceed, as its drawings had not been approved by the architect, and shortly thereafter there followed the demand by the plaintiff for increased compensation."

#### **Compromising and Settling Claims**

The Illinois Supreme Court lately handed down a decision on the binding effect of payments made as in full discharge of a claim, where the creditor later insists that a balance remains due. The substance of the general rules laid down by the Court in this case (*In re Cunningham's Estate*, 142 *Northeastern Reporter*, 740) is as follows:

The payment of a part of a fixed and certain demand which is due and not in dispute is no satisfaction of the whole debt, even where the creditor agrees to receive a part for the whole and gives a receipt for the whole demand; but, if there is a bona fide dispute as to how much is due, a payment of the amount claimed by the debtor to be due in full settlement, if accepted by the creditor, is a satisfaction of the claim. It makes no difference that the creditor protests, at the time, that the amount received is not all that is due or that he does not accept it in full satisfaction of his claim. The creditor must either accept what is offered with the condition upon which it is offered, or refuse it. The fact that the words "in full" are erased from the check or receipt by the creditor does not affect the question whether the proffer and acceptance of the check constitute a binding settlement, where the erasure is without the knowledge or authority of the debtor. There must, of course, be an actual dispute between the parties in order to furnish a consideration for the agreement to discharge the obligation of the debtor for an amount less than the creditor claims to be due; but the fact that the settlement was made on the wrong basis, or that the creditor received in settlement an amount considerably less than he could have recovered, or that he was ignorant of the legal rules governing such settlement, is not a sufficient reason for disregarding the settlement by him with full knowledge of the facts.

#### **Validity of Builders' Risk Insurance**

In taking out builders' risk insurance, a contractor need not protect himself by a general open policy on stock in order to cover loss sustained before actual joinder of timbers together etc., holds the New York Court of Appeals in the case of *Ira S. Bushey & Sons vs. American Insurance Co.*, 142 *Northeastern Reporter*, 340. Effect will be given to his acts in having materials delivered on the ground and in mani-

festing intention to incorporate them into the structure. The Court said:

"We are construing a policy of insurance, and we are not bound by the niceties of definition that might otherwise be proper. When a builder takes out builders' risk insurance, delivers his materials on the ground, and does some manifest act evidencing his intentions to incorporate them into a building, and when there is and can be no dispute about his intention, it would be a harsh rule to require that he should protect himself by a general open policy on stock in order to cover a loss sustained before he had actually joined one timber to another. It was reasonable for the insured to believe that it had covered the risk of loss by fire of its materials when it took out the policy in suit."

#### **Liability for Injury to Children Playing About Uncompleted Work**

Liability of a contractor in damages on account of death of a child through caving in of a ditch in a street was affirmed by the Wisconsin Supreme Court in the case of *Ptak vs. Kuemeyer*, 106 *Northwestern Reporter*, 855. Liability was based on failure to shore the ditch up. The accident occurred after working hours. In the course of its opinion the Court said:

"It has repeatedly been held that, while streets are dedicated primarily for the purposes of public travel, nevertheless it must be realized and recognized that children are accustomed to use highways for the purposes of play. The rule applicable to children of immature age is different from that with respect to adults. The ditch was under construction for a period of about three days. That it constituted a great attraction for children is conclusively established by the evidence, and it would be difficult to conceive how anything would be more likely to interest and attract children than the appeal of the earth in the form of a ditch like the one in question. Day by day children watched the process of construction and stood around the ditch for that purpose. When the men left their employment, they were seen jumping over the ditch, notwithstanding the existence of the barrier. Children, as a rule, are not wise to the operation of natural laws, and such wisdom comes principally from experience and education. Children like Jerome [the child in this case] live in an impressionistic age; their minds are plastic and constitute an ever ready receptacle for impressions of all kinds."

#### **A Fly-Rhyme for Fly-Time**

The time is nigh to swat the fly;  
This annual pest gives none a rest;  
Soak him early, soak him late—  
That's what health officials state.

—*New York Evening Post.*



## Structural Safety in Building

Report of Joint Committee on Structural Safety Representing Architectural and Engineering Societies in the New York Metropolitan District Advocates Placing More Responsibility on the Designing Engineer

THE Joint Committee on Structural Safety representing the New York Chapter, American Institute of Architects; New York Section, American Society of Civil Engineers; Brooklyn Chapter, American Institute of Architects; New York Chapter, American Association of Engineers; New Jersey Chapter, American Institute of Architects; Brooklyn Engineers Club; New Jersey Society of Architects; New York Section, American Railway Bridge and Building Association; New York Society of Architects and the American Institute of Consulting Engineers; has unanimously adopted a series of conclusions and principles covering safety in building construction.

Safety in building construction would undoubtedly be assured as effectively as is humanly possible if all those having part in it were competent, honest, and actuated by a conscientious regard for the protection of the safety of others. Experience has, however, demonstrated that laws and regulations are necessary to restrain incompetent persons who seek to carry out building operations.

Public authorities have therefore been created and laws enacted to control building operations, but it has been found practically impossible for such authorities to control adequately the design and execution of the great number of building operations going on at the same time in populous cities. Further, if it were possible to expand and strengthen the public control over all these operations effectively, it would be undesirable to do so, as it would require excessive taxation and at the same time would tend to place the burden of responsibility for safe building on the public authorities, rather than where it should rest, namely, on the persons carrying out the work.

The owner who seeks a permit to construct or alter a building does so for his own benefit and should be required to prove in advance his regard for the safety of the public by presenting adequate plans and specifications prepared by a competent designer, and as further evidence of good faith should be required to undertake that the execution of these plans shall be placed under the continuous supervision and control of the designer, that every part of the work itself shall be entrusted to competent contractors and workmen and that only proper materials shall be used.

The structural safety of a building is directly dependent on its structural stability, and this can be assured only if the foundations and the entire structural framework are designed and built in accordance with the recognized principles of structural design, the known properties of materials and the established methods of good construction. As a logical sequence, structural safety will be best assured if the planning and superintendence of building work is restricted to architects and structural engineers whose education and training are intended to fit them for just such service. To insure as far as possible the competency of such professional men, advantage should be taken of the existing laws covering the registration of

architects and the licensing of professional engineers by the state authorities.

The placing of competent professional men in responsible charge of the planning and execution of building work can be effective in securing public safety only if they are given full authority and do in fact control the work entrusted to them. The designer must, therefore, not only control the preparation of all plans and specifications, covering structural features on which stability is dependent, but must check and approve all shop drawings and working drawings prepared by others, before they are followed in construction, and he must, in fact, control, personally or by his agents, the execution of the plans and specifications and see that they are lived up to faithfully, and that the entire work at every stage of its progress is carried on with due regard for the safety of the public and the workmen themselves. When clothed with such authority, however, these professional men should carry a corresponding definite and inescapable responsibility.

For the protection of the public, as a voucher of performance, the owner should be required, before use of the building is permitted, to obtain and file with the proper public authorities a certificate signed by the designer in affidavit form stating that the work throughout has been executed in accordance with the plans and specifications and that, to the best of his knowledge and belief, the completed building complies with all requirements of the law and is structurally safe for the use specified.

Failure of the owner to comply in good faith with the letter or spirit of the requirements above stated should be made a penal offense and prosecuted as such, and evidence of incompetence or dishonesty on the part of the designer should be sufficient cause for legal action for the revocation of his license or registration and, where justified, for his prosecution for perjury.

General recognition of the principles above stated and the enactment of the law to make them effective, should materially strengthen the authority and efficiency of bureaus of buildings and other public authorities intended to control building operations, and should in no way weaken or diminish their present prerogatives.

Building codes as now written are a selection of minute rules attempting to cover in detail all elements of building construction. It is manifestly impracticable to do this in a way to insure structural safety effectively in the great variety of situations met in building operation. When design and superintendence of construction are definitely restricted to competent professional men, these codes may be written of simpler and more effective lines, and the responsibility for safe construction thereby more definitely placed on the owner and his professional agents.

The Committee recommends that a law be prepared to embody the following requirements governing the granting of permits and the execution of all building operations.

1. The owner shall be the applicant for the building or construction permit, and shall be required to accompany his application for such a permit with the following:

a. Adequate plans and specifications prepared and signed by a competent registered architect or a licensed professional engineer experienced in structural design, hereinafter called the designer.

b. A definite undertaking executed in legal form stipulating that if the permit is issued to the applicant he will have all working or shop drawings covering parts and details essential to the stability of the building and required to supplement the plans accompanying his application fully checked, approved and signed by the designer; that he will place the execution of the work under the direct supervision and continuous control of the designer; and that he will further undertake, with the cooperation of the designer and by employing only competent contractors and workmen, to perform faithfully the work proposed, in strict accordance with the plans and specifications, in compliance with all requirements of law, and with due regard to public safety.

2. Before a certificate of occupancy is issued by a Bureau of Buildings or by any state or local authorities having jurisdiction, the owner shall furnish to such authorities a duly executed certificate signed by the designer stating that he has faithfully supervised the entire work of construction, that it has been executed in accordance with the plans, specifications and working drawings duly signed by him, and that to the best of his

knowledge and belief the finished work complies with all the requirements of law and is structurally safe for the uses specified.

3. Failure on the part of the owner to comply with any of the above-specified requirements shall be regarded as presumptive evidence of a violation of law, constituting a penal offense, and shall be punishable as such.

4. If at any time after the certification of the designer has been filed, conclusive evidence is furnished to the state licensing authorities that any statement in such certificate is false and intended to deceive, these authorities shall immediately take the necessary legal steps to have the signer put on trial for perjury, shall henceforth have his name stricken from the list of registered architects or licensed professional engineers, and shall give their action effective publicity.

It should be made possible at any time during the process here outlined to substitute a new owner for the original owner, provided that the new ownership is duly recorded on the original papers by affidavit and that such new owner assumes all the obligations that would have been his had he signed the original paper. Likewise, a new registered architect or licensed professional engineer, having structural experience, may be substituted for the original designer on record, provided that a like transfer of all obligations shall be recorded on the original papers and these obligations be assumed by the new registered architect or licensed professional engineer as if he had signed the original plans.

## Efflorescence: Its Cause and Remedy

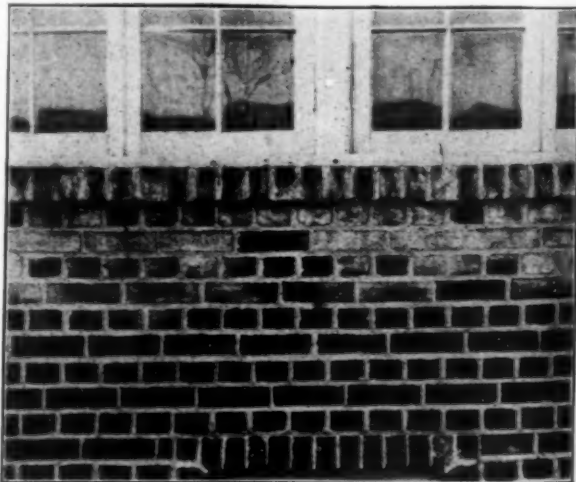
**A**LL masonry materials—stone, brick and concrete—are subject to possible efflorescence. Its occurrence is more common in the materials which are of a more or less absorptive nature. Thus, common brick frequently exhibits it, and likewise the more porous stones.

Efflorescence is caused by the depositing of soluble salts on the wall surface after the water of solution has evaporated. These soluble salts may exist in the mortar used in laying up the stone or brick, or they may exist in the brick or stone.

The action which causes efflorescence is—water from rain, or drainage off window sills or eaves, soaks into the masonry walls and dissolves some of the soluble salts either of the mortar or the masonry material itself. After the rain has ceased, the water is drawn to the surface and evaporates, leaving the dissolved salts in the form of whitish crystals on the surface of the wall. This is the familiar "efflorescence," and it will be noticed that the presence of efflorescence is most common under window-sills, roof copings, and other points where there is the greatest amount of water to soak into the wall.

The question then presents itself—"Why doesn't the white deposit

dissolve and wash off in the next rain?" The reason is that upon exposure to the air these salts change their nature, absorbing carbon dioxide from



**A VERY CHARACTERISTIC TYPE OF EFFLORESCENCE**

Notice that the white deposit is located directly under the window-sill, a place where the rain-water washes over and soaks into the brick—later evaporating and leaving the soluble salts deposited on the surface of the brick. A short distance farther down the wall the brick are free from the deposit, a convincing proof that the primary cause is absorption of moisture and subsequent evaporation.

the air and becoming carbonates, and hence largely insoluble in water.

From the explanation of the action of efflorescence, it will be apparent that the presence or absence of efflorescence is mainly due to local conditions, such as the amount of absorption of the masonry material, the degree of exposure to rain-water, drippings and drainage, rather than to any factor inherent in the mortar or masonry material.

#### Remedy for Efflorescence

Since the absorption and evaporation of surface water is the primary cause for efflorescence, anything which will eliminate this absorption will aid in preventing efflorescence. The application of one of the colorless waterproofing compounds to the surface of the wall will eliminate absorption, and hence be of help. Among these materials might be mentioned sodium silicate (water-

glass) and magnesium fluosilicate as surface applications to concrete and stucco surfaces. These may be obtained commercially under trade names from a number of manufacturers. Colorless surface applications of the dissolved paraffin type also should be beneficial for application to brick and stone walls.

For efflorescence already existent, the only remedies are brushing with a stiff fiber or wire brush, or the removal by scrubbing with an acid wash consisting of 1 part of commercial muriatic acid and from 4 to 10 parts of water, depending upon the amount of efflorescence present. After the white deposit is removed with the acid wash, the acid is thoroughly rinsed off. The deposits may recur and require additional acid washes, but the amount of deposit should be less each time, due to the dissolving out of all the soluble salts, and hence the deposit should disappear after a time.

—Contractor's Atlas.

## Campaign to Reduce Shortage of Skilled Labor

Federal Board for Vocational Education Working Against the Lure of "White Collar" Job

**D**ETERMINED to take action which will reduce the shortage of skilled labor in the construction industry, general contractors throughout the entire country are appealing to boys and youths who are graduating from schools and colleges, laying before them the benefits to be gained from entry into the building trades.

The campaign against the lure of the "white collar" job, initiated several weeks ago by the Associated General Contractors of America, is being aided by the cooperation of the Federal Board for Vocational Education. The government agency has issued a bulletin to its agents and to educators generally in every state, outlining the efforts being exerted by the contractors and indicating the means which may be taken by those within its sphere of operation to add to the success of the movement.

"Building trades employers in each community are planning to visit the public schools this year and explain to the graduating classes the advantages of apprenticeship in the building trades, according to the program announced in the current issue of the *Constructor*, national organ of the Associated General Contractors. An appeal to members of the A. G. C. to volunteer for this service was featured in the issue. Supplementing this appeal, the *Constructor* published an article by G. A. McGarvey, of the Industrial Education Division of the Federal Board for Vocational Education, giving practical suggestions to contractors how to successfully address an adolescent audience. The plan has attracted wide attention on the part of employing builders, who are confronted with the perennial problem of recruiting satisfactory apprentices.

"Such a step on the part of the contractors is a development of the first significance to vocational education. It is another indication of the increasing willingness of employers to cooperate with the public schools. It will strengthen the feeling of mutual serviceability between the schools and the economic interests of the community.

"The value of vocational talks to school pupils by practical business men must be far-reaching.

A dynamic presentation to schoolboys of the advantages of building trades employment will do much to counteract the present mistaken tendency of youths to crowd into the "white-collar" occupations. The message of the employer will reach the boy at the turning point in his life. It will come to him at his most impressionable and plastic age. It will be a service of vocational guidance which is acutely needed by many of the pupils of our public schools.

"With the contractors taking the initiative in such a program, it behooves our school heads to meet them half-way, and more. The vocational teachers and supervisors should act as liaison officers to this end. Contact should be established in each locality between the public school principals and the officers of the local building trades employers' association, in order that adequate preliminary arrangements for the visits be made. The occasion of the visits should be staged with careful forethought. A cordial spirit of welcome should greet the contractors when they come.

"The plan is, of course, experimental on the part of the A. G. C. this year. But, by a proper spirit of cooperation, the schools have an opportunity to persuade the contractors to make the program permanent. Moreover, through the contacts thus established, the schools will often be able to win the interest and support of the contractors in the part-time vocational program for apprenticeship training. All in all, it is an exceptional opportunity for the schools to cement ties of cooperation between themselves and industry. The program should have the support of every progressive educator."

By making this move at once, general contractors throughout the country are laying the foundation for a systematized and highly productive method of securing apprentices each year in the future. If the movement can be so well established this year as to implant itself as a practicable annual action, educators will be able and glad to work hand in hand through the weeks leading up to graduation week each year to continue the movement.

## A Practical Road Show

Road-Building and Maintenance Demonstration at Greensboro, N. C., a Great Success

**A**T the road-building and maintenance demonstration held under the auspices of the American Road Builders' Association and the North Carolina State Highway Commission, June 3 to 7, in conjunction with the visit of the Pan-American Highway Commission, this country gathered together a very large group of practical road builders and road machinery in action. The Pan-American Highway Commission consists of a group of about 50 men identified with highway work in practically all of the South and Central American countries. They have come to the United States as guests of American road builders to familiarize themselves with the financing, construction and maintenance of highways as carried on in the United States.

The Pan-American Highway Commission gathered in Washington on June 1, and visited Arlington, Va., to see the experimental work of the United States Bureau of Public Roads. Then the trip through the South began. On Wednesday, June 4, they traveled from Raleigh to Greensboro, N. C., via Durham, Chapel Hill, Hillsboro, Graham and Burlington.

By the time the Commission had arrived at Greensboro, the Central Demonstration of road machinery at the Central Carolina Fair Grounds was in full swing. Over \$500,000 worth of machinery was exhibited and most of it placed in action each day. It was no uncommon sight to see four or five tractors parading around the grounds with trains of wheeled scrapers or hauling various kinds of graders. The little one-man graders kept the dirt roads within the grounds in fine condition and demonstrated their serviceability. A huge steam shovel vied with a gasoline shovel in making big holes in the ground and piling the dirt up alongside. As soon as the piles of dirt began to grow, wagon loaders would back up to them and demonstrate their ability to annihilate piles of construction material. At other times, both large and small dump-trucks would line up by the steam shovels to receive a generous load of dirt and then go tearing off to dump the loads wherever there was anybody particularly interested in that kind of truck or dump body.

Material men were well represented and several of the road magazines had booths. The exhibits included steel treads for wooden bridges, steel bridges built upon the ground, products to increase the workability of portland cement concrete, asphalt distributors, several asphalt producers, and large and small steam rollers. A miniature crushing and screening plant was in full operation, a subsoil planer rested on a pair of tracks ready to operate and demonstrate its ability; in fact, every kind of road machinery was there to be shown off, not as a painted statue, as at the Chicago Road Show, but as a giant or a midget ready to perform its task in producing a new road or maintaining an old one.

On Thursday, June 5, there was an all-day automobile trip, in which a number of large buses and touring cars took part. Fully 1,200 attendants had the pleasure of seeing two concrete road projects under way and two dirt roads under construction. From Greensboro, the caravan pro-

ceeded along Route 70, which included a reinforced concrete pavement 18 feet wide, 6 inches in thickness, 7.8 miles long, built in 1923, at a cost of \$282,550. This Project No. 535 was followed by Project No. 536, which extends from the end of the first project to the Guilford-Rockingham County line and which is now being constructed by the Hagedorn Construction Company, Greensboro, N. C. This is a plain concrete road, 8 inches thick at the sides, 7 inches thick at the centers, 18 feet wide, and extending 5.15 miles. The estimated cost of the project is \$192,120. The concrete mix is made of one part cement, two parts sand and four parts crushed stone. The materials are unloaded from drop-bottom gondola cars to local bins with a bucket elevator, then measured into Ford trucks equipped with home-made dump bodies and Easton Car & Construction Company dump bodies. These trucks haul the material to a 21-E Foote paver, which mixes it and delivers it to the roadway between the Blaw-Knox forms.

An Austin-Western Pup roller, with scarifier and grading blade attached, rolls and smooths the subgrade ahead of the mixer. Before placing the concrete, the subgrade is checked with a wooden template. Immediately after pouring, the concrete is struck off with a North Carolina standard steel screed, and five men keep leveling, spading and tamping the concrete in front of the template.

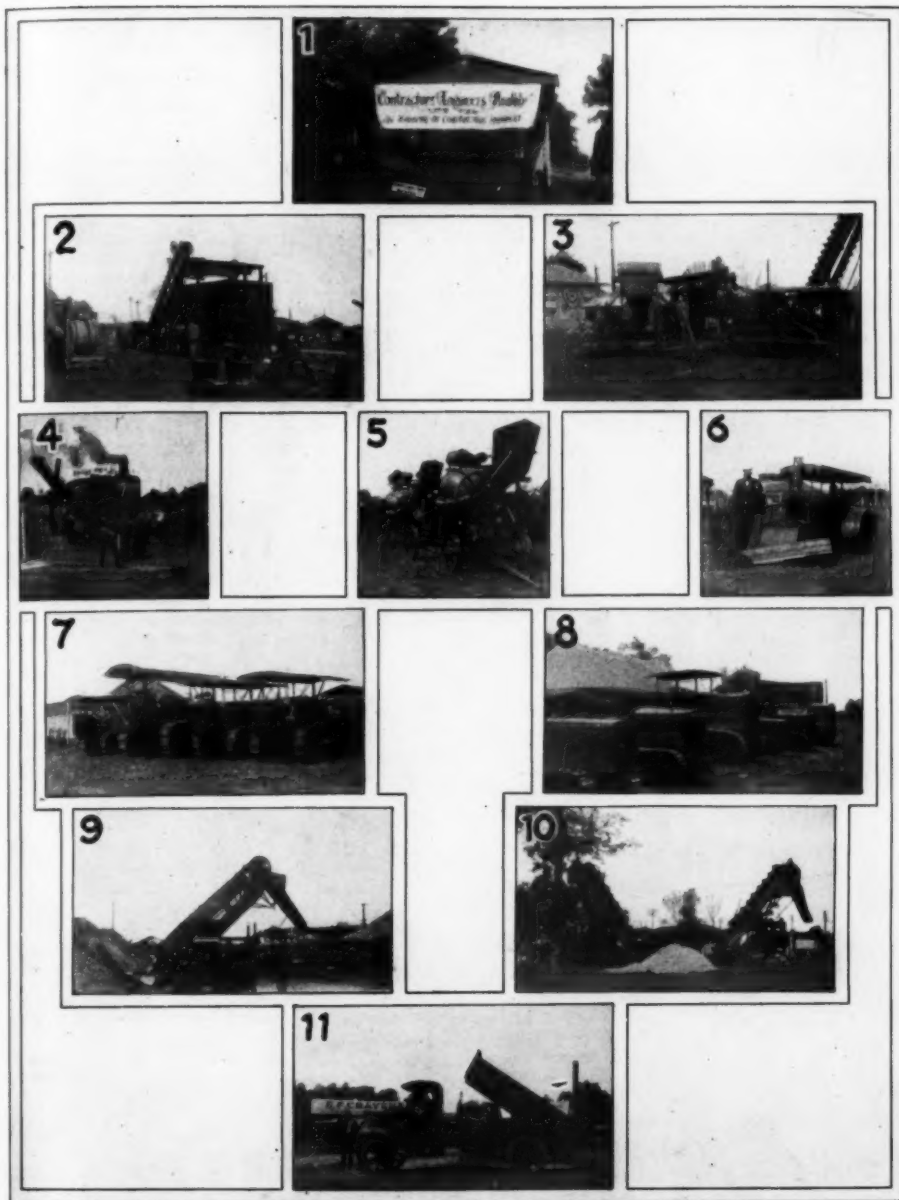
The concrete is finished by means of a North Carolina wooden float, which removes laitance and excess water. This also takes out small irregularities. The final finish is obtained by the use of a standard bow belt, which gives the surface a gritty herring-bone finish.

The finished concrete is protected by a wet burlap cover until it has hardened sufficiently, when the covering is removed and the entire surface, including the sides of the pavement, is watered thoroughly and covered with earth, at least 2 inches in depth. This material is kept wet for a period of 10 days, and at the end of 14 days is cleaned off and the pavement is opened to traffic.

William Catchings is the engineer in charge of the project for the North Carolina State Highway Commission.

Immediately adjacent to this work is Project No. 592, which is also under construction. This latter project extends from the Guilford-Rockingham County line to Reidsville, and is being constructed by Zierler & Dalton Construction Company, of Junction City, Kansas. The concrete pavement is 18 feet wide, 8 inches thick at the sides, and 6 inches in the center. The concrete mix is composed of one part of cement, two parts sand and four parts crushed stone. The materials are loaded with a steam shovel into bins adjacent to the railroad, and measured by a central loading plant, then hauled to the 21-E. Koehring paver in International, White, Packard, Mack and GMC trucks. Celite is used with the cement by the contractor to make the placing of the concrete easier. Blaw-Knox road forms are used on this project.





#### THE CENTRAL DEMONSTRATION OF THE NORTH CAROLINA ROAD SHOW

1. Our booth near the main entrance to the Central Carolina Fair Grounds where the Central Demonstration of road machinery was held. 2. Champion mounted bin and crusher, Novo diaphragm pump in foreground, in the North State Culvert & Machinery Company exhibit. 3. Monarch tractor towing Ransom 7-S mixer into place. 4. McMyler-Interstate steam shovel smoking up. Its decorations included the American flag and the full quota of flags of the Pan-American Republics. 5. A line of Wonder mixers in the E. F. Craven exhibit. 6. You can ride on an Austin Pup. 7. The Best tractor line-up. 8. Yancey Bros. exhibit of Holt tractors. 9. The Haiss loader getting ready to hustle some dirt. 10. Barber-Greene loaders. 11. A Mack dump-truck



The subgrade is prepared ahead of the mixer by a Lakewood subgrader and rolled with a 10-ton Kelly-Springfield three-wheel roller. The subgrade back of the mixer is checked with a hand template and then sprinkled. After being dumped from the mixer the concrete is spread by hand to a fairly uniform surface, which is from 1 to 2 inches above the finished grade. It is then struck off with a Lakewood screed, so shaping the pavement surface that it is finished at the established grade. Sufficient labor is kept in front of the screed to keep any excess material from accumulating and being pushed ahead of the strike-off, which is checked at intervals in order that an even and uniform contour may be assured.

After the concrete has been struck off, a North Carolina wooden float is used to remove laitance and excess water; then the surface is rebelted and finished by means of a Lakewood float bridge and small hand-finishing tools. The finished concrete is protected by a wet burlap cover until it has hardened sufficiently, when the covering is removed and the entire surface, including the sides of the pavement, is watered thoroughly and covered with earth to a depth of 2 inches in a manner similar to that used on Project 536.

From these two interesting concrete road demonstrations, the parties continued towards Reidsville over top-soil roads varying from 22 to 30 feet in width. The comment on these roads was uniformly favorable, as they were particularly smooth and easy riding and, in fact, proved more comfortable as far as riding qualities went than the last stretch of concrete road met in the evening as the caravan approached Greensboro. Except for the excessive dust upon the road, it was all that could be asked for moderate traffic.

At Yanceyville, all the visitors were the guests of Nello L. Teer, of Durham, N. C., contractor for many hundred miles of dirt road in North Carolina and particularly the contractor for Project No. 513, which was visited after the barbecue had been served at 1:30 P. M.

Project No. 513 is southeast of Yanceyville. It is of top-soil or sand-clay construction, 9 inches at the center and feather-edged to be 30 feet wide. All of the work, from clearing and grubbing and excavation to the placing of top-soil on the road, was demonstrated.

As much of the right of way as the engineers required must be entirely clear of trees, logs, brush and other perishable material, which has to be burned or otherwise disposed of. In embankments of 2 feet or less in height, all stumps and roots are grubbed and removed. Following this, the necessary drainage structures are placed and ditching done to insure the drainage of all spongy spots, in order that such places may not delay construction.

The most modern and economical ways of handling excavation were shown on this project, including the use of a  $\frac{3}{4}$ -yard steam shovel and dump-trucks and wagons. Best Thirty and Sixty tractors were shown hauling excavating-graders, trains of dump-wagons, blade graders and harrows. At one end of the project, excavation was in progress, using teams of mules and wheeled scrapers. At the other end, top-soil from a neighboring corn field was put on the prepared subgrade with dump-wagons. This surfacing material must be top-soil or sand-clay properly proportioned and mixed by nature, must be free from all weeds, vegetable or other foreign matter, and must contain no stone larger than 1 inch. The material is evenly mixed on the sub-

grade to such a depth that when compacted it will have the thickness and cross-section required by the plans and specifications. After sufficient material has been dumped for about 1,000 linear feet of road, it must be plowed and spread to the required cross-section and harrowed to secure uniformity. A standard road machine weighing not less than 2,500 pounds is used to bring the surfacing material to the proper cross-section, and both disk and tooth harrow are used to secure uniform density. Beginning the day after it is laid, and continuing each day for three days, the newly laid surface is harrowed and reshaped. After the three-day period, it is reshaped only after rain, when the material is in condition to rework.

From this project the caravan traveled at high speed back to Greensboro over about 55 miles of top-soil road and about 16 miles of concrete pavement.

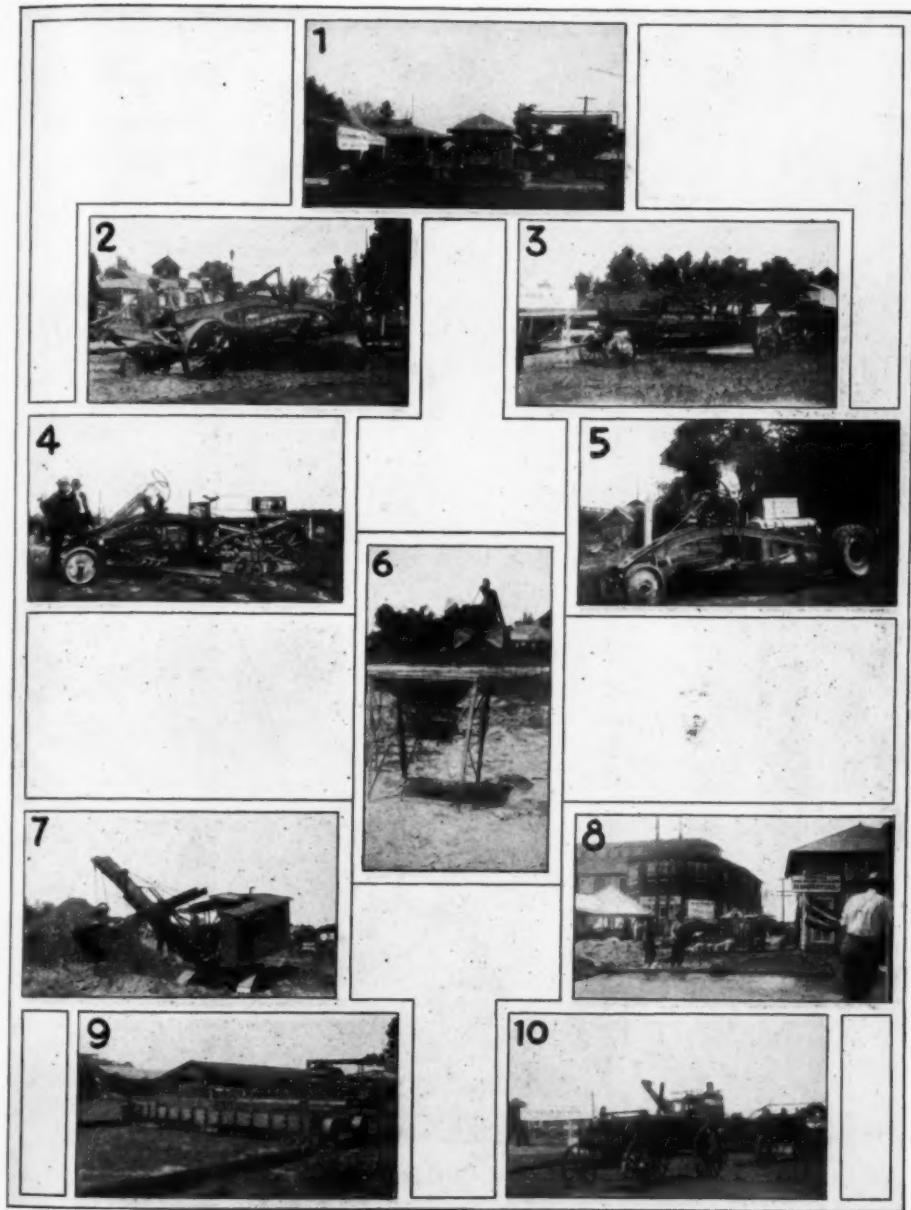
On Friday, June 6, the Pan-American Highway Commission attended the Central Demonstration and a barbecue at noon, then left for Winston-Salem, via Colfax and Kernersville. On Saturday, the delegation visited North Carolina Highway Project No. 743 at Walkertown, where 11.3 miles of 2-inch asphaltic concrete surface is being placed on a 1:2½:5 mix 5-inch concrete base. The estimated cost of this project, which is being constructed by the Atlantic Bitulithic Company, Washington, D. C., is \$414,670. The materials for the concrete base are measured by a Barber-Greene loading and measuring device, and carried by trucks to the Foote paver, which is of the 21-E type, and pours the concrete between the Hetzel steel forms. After the mixture is prepared, it is chuted to the subgrade, where it is distributed into place by at least three men working ahead of the standard finishing tools, as mentioned in the other projects. The concrete is covered with burlap and sprinkled for 24 hours, after which it is uncovered, but kept moist for a period of seven days.

The asphaltic concrete wearing surface is of the coarse aggregate type, graded from 1¼ inches to 0.02-mesh particles, with the large sizes predominating. With this aggregate is mixed from 6.0 to 6.5 per cent bitumen. The mixture is laid on the prepared concrete base to a compacted thickness of 2 inches, on which a thin uniform coating of asphaltic cement is squeegeed and rolled with a 3-wheel 10-ton Kelly-Springfield roller; then it is uniformly covered with  $\frac{3}{8}$ -inch, 10-mesh stone particles. These stone particles are spread on by means of a Warren Brothers chip spreader, and the entire mass is then rolled to ultimate compaction by means of an 8-ton tandem Kelly-Springfield steam roller.

On Sunday, June 8, on the way from High Point to Charlotte, the Commission inspected the Yadkin River bridge, described in detail in the April, 1924, issue of *CONTRACTORS' AND ENGINEERS' MONTHLY*.

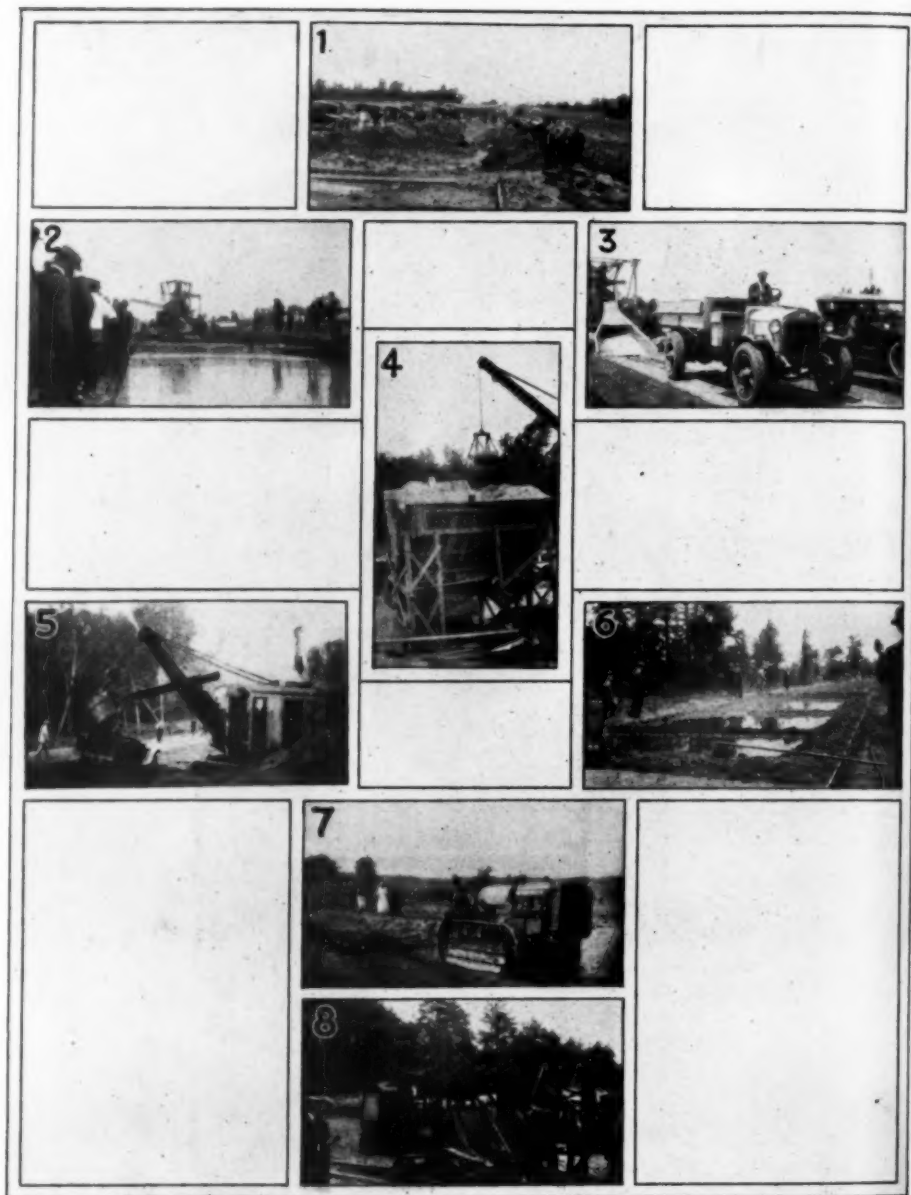
On Monday, June 9, the caravan proceeded from Charlotte to Asheville, via Gastonia, Ruthersfordton and Hendersonville. This day's trip included 3.7 miles of penetration macadam, one mile of 18-foot, 5-inch graveled road on a concrete base with Topeka surfacing, and a very general variety of concrete and bituminous roads.

On Tuesday, June 10, the South American visitors took the trip from Asheville through Waynesville to Sylva, inspecting various types of mountain road construction. The return to Asheville was made by train.



## MORE SCENES AT THE CENTRAL DEMONSTRATION

1. The main entrance to the Central Demonstration, showing the Alan Wood steel treads on a bridge floor and Page woven wire highway guard fencing on pipe rails. 2. Adams leaning wheel grader showing its digging-in qualities. 3. The Russell Super-Mogul graders made good use of a lot of space individually and collectively. 4. A Wehr one-man grader with Full-Crawler treads on Fordson tractor. 5. Hadfield-Penfield one-man grader with Whitehead & Kales dual wheels on Fordson tractor. 6. Miniature Blaw-Knox bucket and Batcher plant specially posed from the Earnest Bros. exhibit. 7. F & H Model 206 shovel going back for more. 8. Laying the Atlas Lumnite cement road at entrance. The road was opened to traffic in 24 hours. 9. A Lakewood subgrader in repose. 10. The Watson wagon line-up



## SCENES FROM THE PROJECT DEMONSTRATIONS NEAR GREENSBORO, N. C.

1. The crowd and about half the motor caravan that carried the "Shirt-Sleevers," first to Project 592, then to Project 536, a barbecue and Project 513. 2. The Koehring 21-E paver at work on Project 592. 3. A GMC truck, one of the fleet serving the mixer. 4. The steam shovel loading bins at the central proportioning plant. 5. Erie shovel loading dirt into Ford trucks on the grading work of Project 513. 6. Curing the concrete on Project 536 by the ponding method. 7. Best "Thirty" tractor and road plane at work on top-soil Project 513. 8. Barber-Greene vertical-boom trench excavator working near the Central Demonstration. This machine, delivered to the North Carolina Public Service Company, at Greensboro, on June 2 dug 450 feet of 5-foot trench, moved 3 miles and dug 100 feet; the next day it dug 875 feet of trench.

## Illinois Highway Department Discontinues Use of Bidders' Bonds

Distinct Step in Advance an Aid to Highway Contractors in Illinois

**S**INCE the first of April of this year, the Department of Public Works and Building, Division of Highways of the state of Illinois, has discontinued the use of bidders' bonds in road letting. All proposals must now be accompanied by a certified check amounting to 10 per cent of the bid, payable to the State Treasurer of Illinois, and bids not so submitted are rejected as irregular.

Each proposal for road or bridge work must be accompanied by a sworn financial statement on forms furnished by the Department, and each proposal must be accompanied by a questionnaire properly filled out, the form of which is stipulated by the Department. The questionnaire reveals the contractor's responsibility, experience, equipment and general ability to prosecute in a satisfactory and efficient manner the specific work covered by the bid. The questionnaire and financial statement are considered as a part of the proposal, and the acceptance of a bid is now based on the contractor's responsibility as revealed by the information so furnished.

This policy has been adopted by the Department after a detailed canvass of the policies in force in other leading state highway departments. It is believed that such a policy is absolutely fair to all responsible bidders, as well as the surety companies, and that the requirement of certified checks amounting to 10 per cent of the bid is one easily met by any contractor whose finances and experience are adequate to insure vigorous and prompt prosecution of the contracts taken. It is expected that these policies will eliminate much of the embarrassment as well as actual loss which the people of Illinois have experienced as a result of the non-performance of a comparatively few irresponsible contractors on state road and bridge work. In the letter transmitting this information, "To all road and bridge contractors," signed by Cornelius R. Miller, Director, State Department of Public Works and Buildings, and Frank T. Sheets, Superintendent of Highways, the Department expresses its appreciation of the splendid construction record and the fine spirit of cooperation which the great majority of contractors in Illinois have established.

### Financial Statement

The financial statement under "Assets" requires the recording of the amount of cash in the office, not in the bank, cash elsewhere, with explanation as to its whereabouts, and cash deposited in banks, a list of the notes receivable and the amount of money due for work completed on unfinished contracts, a list of stocks, bonds and like securities, real estate, a full description of the plant, materials at hand, the value of patents owned by the contractor, the figure at which he holds his good-will, and a statement of other assets.

Under "Liabilities," the contractor must list

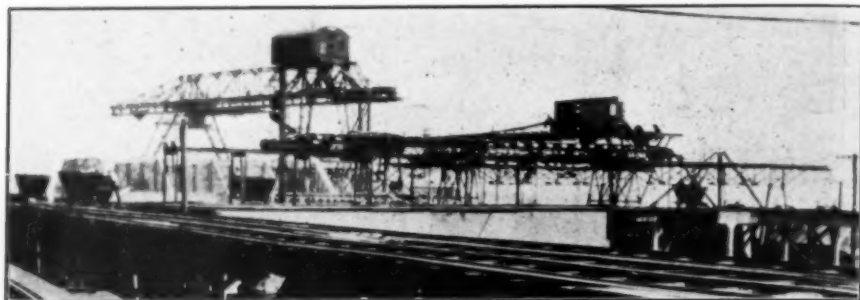
notes payable, accounts payable, mortgages on real estate, capital stock if it is a corporation, including surplus and undivided profits, bonded indebtedness and other liabilities. The statement must be sworn to by the individual contractor or, in the case of a firm, all the partners, or, in the case of a corporation, two of the principal officers.

### The Questionnaire

The questionnaire includes the following questions, aimed to bring out the experience and reliability of the contractor, in addition to the statement of his financial strength:

1. How many years' experience have you had in highway construction as a general contractor?
2. How many years' experience have you had in highway construction as a subcontractor?
3. On what types of construction have you been mostly engaged?
4. Have you ever performed any work for the U. S. Government? If so, where, and to whom do you refer?
5. For what State Highway Department have you performed work and to whom do you refer?
6. Under what county have you performed work and to whom do you refer?
7. For what city have you performed work and to whom do you refer?
8. For what corporation or individual have you performed work, naming corporation or individual?
9. What is the largest contract you have ever had, and where, giving in detail the type of construction, etc.
10. Have you ever failed to complete any work awarded to you? If so, where and why?
11. Explain herein your plans for carrying on the work included in this section, if the contract should be awarded to you, stating when you can start work, and submitting your proposed working schedule.
12. How are you going to handle the hauling on this section? Give type of equipment.
13. Do you own and operate this equipment?
14. Do you intend to sublet the hauling? If so, give name of subcontractor, amount and type of equipment which he owns and operates, names of references, and a financial statement covering his resources.
15. List of equipment on hand and available for use on this section.

The last question requires a statement of the quantity of various pieces of equipment, a complete description covering size, capacity, etc., the condition of the equipment, and the number of years in service; first, for equipment on hand and available for use on the job, and second, a list of the equipment to be purchased for this particular job.



BIRD'S-EYE VIEW OF CRANE WHICH HOISTS SAND AND GRAVEL FROM SCOWS IN THE RIVER BELOW TO THE CONVEYOR SYSTEM

## A Modern Sand Plant

The Ohio River Sand Company Uses Modern Methods and Machinery to Reduce Handling Costs to a Minimum

THE Ohio River Sand Company, of Louisville, one of the largest and most prosperous sand and gravel organizations in the Central West, recently completed the major portion of a new sand- and gravel-unloading plant at its Riverside yards and headquarters just east of the steamboat landing on the Ohio River at Louisville. The improvements cost around \$250,000, or at least the work that has been done, and continuation of the belt conveyor system out over the other sections of the yards, along with replacement of the old steam unloading plant now used as an auxiliary, will bring the cost up to about that figure.

The improvements were handled by the Brown Hoisting Machinery Company, of Cleveland, Ohio, which designed the plant and installed the equipment. This plant is erected for unloading sand and gravel barges as they come in to the company's private landing from a point a few miles east of Louisville, where the company keeps two dredges or digger boats busy pumping sand and gravel from the bottom of the Ohio River, it being washed on the dredge boats, loaded into wood and steel barges and towed to the local landing.

For years the method of unloading was by an incline. A derrick boat, equipped with a clam-shell bucket, lifted sand and gravel from the barges and placed it in a hopper on a float. Elevation to the yard, or hoppers on the hill, was accomplished by means of small cars, operated by a cable on the incline. The power used in this plant was steam.

After reaching the top of the incline, which was several feet above the yard surface, the cars were switched over trestles to various yard piles, or hoppers, the bottom released, and the contents dropped. These cars were given a good yank with the cable as they came over the top of the incline, and traveled largely by the speed thus developed to the point of unloading, but had to be hand-shoved back to the power plant, which was a slow and unsatisfactory method. The old plant is standing and at present is being used principally for unloading sand,

but will be replaced with a more modern plant later on.

The new plant is known as a "bridge crane." A steel bridge is built on the river bank extending back into the yard. The crane, electrically operated, travels on rails but over the water's edge, drops its bucket to the barges, picks up a load, and returns to the shore side, where the contents are dropped into a concrete hopper, which in turn feeds a belt conveyor system. The system is chuted so that the material can be belt-delivered directly into cars on the company siding, or carried to almost any section of the yard, and delivered into hoppers or yard piles, as the belt system works on trestles. The conveyors are Brownhoist equipment with Timken roller bearings and Manhattan belts.

A barge contains 250 cubic yards of material, and gravel weighs around 3,000 pounds to the yard. Figured in tons, a barge contains about 375 tons. The crane has an unloading capacity of about 200 tons an hour. It is electrically operated throughout by motors furnished and erected by the Westinghouse Electric & Manufacturing Co.

The motor power and equipment for operating the bridge crane is all contained in the bridge house, hung at a giddy height above the ground. The Thomas Elevator Company, of Chicago, furnished the car puller equipment, which is powerful enough to handle a considerable string of cars, as they are slowly filled with gravel and kept moving as the load is installed. A Weighometer is used in weighing cars, and weighs the loads as they pass over the belt conveyors to the car-loading chute. The belts are 36 inches in width.

The concrete hoppers installed have a capacity of about 5,000 cubic yards, or 20 barges, and are divided into compartments for handling various sizes of screened gravel. Loading to trucks is done by gravity from the bottom of the hoppers. In addition to the hoppers, they have yard room for storage of 90,000 yards for winter use.



For years the company has been using Leschen Red Strand cables in handling operations of its steam plant and boat operations, and specified Leschen cables wherever steel cables were used in erection of the new plant.

The present river equipment used in dredging or sucking up sand and gravel from the bottom of the river and transporting it to Louisville, includes fifteen wooden barges, four all-steel barges, one steam towboat, two dredge boats, one unloading digger boat at the receiving plant, and one pump boat, used to keep the hulls of the fleet clear of water during the winter period, when put up in the canal, or behind an island where they will be safe from ice jams.

In some years river digging is possible almost throughout the year, although digging is not often handled at a maximum depth of more than 20 feet. Cold weather and ice stop operations, as the stuff freezes in the barges as loaded, and cannot be taken out except by steam thawing, and this incidentally means great hardships for the workers. When heavy ice begins to run it means destruction of boats and equipment, with the results that in late November or early December digging generally comes to a stop, and all equipment is placed in a safe ice harbor until the following spring. This also gives the company a chance to overhaul worn machinery and make repairs which would be almost impossible during the busy season.

As a rule, sand and gravel are taken from the river at a point about 8 miles above Louis-

ville, there being a fairly wide cruising radius for the digger boats, which sometimes operate 4 or 5 miles out of the city and again at close to 12 miles.

The dredging operations are about the same as found in river sand handling at any point, except that all material is handled by suction nowadays, whereas years ago it was handled by clam-shells. Transportation is merely a question of connecting a steam towboat to the barges, and bringing them to destination, and moving the empties back. Unloading on a river bank where the stage of water is hardly ever the same for 24 hours, however, presents some difficulties. Any equipment used must be so arranged that it can take care of a difference of 30 feet or so between high water and low water.

The crane bridge, of course, represents economical construction, and the first of its kind seen in this section, which has a good many coal- as well as sand- and gravel-unloading plants unloading river barges. The reduced cost of handling in this way will prove a considerable item, in addition to the increased speed of handling, which is a big item where high-priced labor is used.

ACKNOWLEDGMENT.—Published through the courtesy of *Cement and Engineering News*. Illustrations by courtesy of Ohio River Sand Company.



AN AIRPLANE VIEW OF THE OHIO SAND AND GRAVEL COMPANY'S PLANT FROM THE RIVER SIDE

## Experiments with Concrete in Sea Water at St. John, N. B.

Interesting Results of Tests Which Have Extended Over Four Years

By William J. McNulty

**E**XHAUSTIVE tests of concrete in tidal salt water in Canada are proving that concrete docks can be so improved as to be practically tide- and salt-proof. Very quietly for the last four years, tests have been made in the various harbors of Eastern Canada, but particularly in the harbor at St. John, N. B., which is distinctive for abnormally high and low tides, ranging from 20 to 32 feet.

At present, test specimens of concrete are being experimented with at high, low and mid-tides in St. John harbor. In addition to these, specimens of concrete made of varied mixtures of sand and gravel secured from local beaches have been placed under water, and the action of the tide and salt water carefully watched. In some of the specimens, sand from Nigger Point near St. John was used. It was found that while the sand is really too light and has a few traces of organic impurities, it could be substantially improved by the addition of coarse sand. Fresh water from the city mains of St. John was used for the mixing. The engineers in charge of the tests, A. G. Tapley and Alexander Gray, have found it improves the quality of the concrete to mix the sand and gravel separately from the cement and water, then merging the two mixtures. They have also found that concrete should contain 1.8 barrels of cement per cubic yard of concrete for the best results.

The tests have also shown that Celite, metallic oxide, hydrated lime, and puddled clay can be utilized in concrete. About 10 per cent of the

metallic oxide can be used. It was found that while these mixtures reduce the strength of the concrete slightly, they prevent deterioration.

One of the interesting results of the tests has been to show that the damage to concrete in tidal salt water has not been by chemical action, but rather by mechanical action at St. John. It was found that during the summer there was little change in each of the specimens. In the winter and spring, however, the cold water is forced through the concrete by capillary attraction. The tide then falls and leaves the concrete exposed to cold weather. The water in the concrete freezes and expands, making small cracks appear in the concrete. The cracks will show on the surface, but will soon penetrate, and in a short time the concrete is broken up. The tests have further shown that the effects of this mechanical action can be greatly reduced by the use of waterproofing material, adequate mixing, and the use of absolutely clean materials.

Asphaltic concrete is now being used in some of the tests. In several places in Canada, tests are also being made on the effect of certain soils on portland cement concrete. In some places it has been found that certain alkali soils have brought about the deterioration of the concrete.

As a result of the severe tests at St. John, probably all the wooden docks in that harbor will be replaced by concrete docks in the next few years. Four concrete docks and a dry dock, also of concrete, have been built, and two concrete docks are under construction.

## Bids for Professional Engineering Services

Case 45 of the A. A. E. Practice Committee Reviewed

**P**RACTICE case No. 45 has been submitted by the National Practice Committee of the American Association of Engineers to the Board of Directors for approval at its next meeting. This case is of fundamental importance to the engineering profession and particularly to practicing engineers. It was brought up by several recent instances which have been reported where cities have invited engineers by letter or advertisement to submit competitive bids or sealed proposals for furnishing specified engineering services and to furnish with their bids bonds for the satisfactory performance of their services and also to furnish a guarantee that the cost of construction would not exceed their estimate.

This lamentable practice, which can only secure the services of second-rate and discredited professional engineers, violates all the principles of good professional conduct. For engineers to submit competitive bids or sealed proposals for furnishing specified engineering services is not consistent with the highest professional standard. Competition between engineers for professional work should be minimized. It should be countenanced, if at all, only in those cases where pro-

fessional qualifications are clearly the paramount consideration and the question of relative fees is not a deciding factor. To make professional work a matter of money competition not only lowers the standards of the profession, but is detrimental to the interests of the public.

The requirement for engineers to furnish bonds for the satisfactory performance of their services or to furnish a guarantee that the cost of construction will not exceed their estimates should not be tolerated. Such requirements are incompatible with a sound and conscientious professional attitude of the engineer toward his client and his work, and unavoidably conflict with the proper discharge of the engineer's obligations to his clients. The public should be educated to a proper conception of the professional attitude which gives its best in service or expert advice without influence or prejudice by fear of penalty or hope of great reward. An engineer should maintain the professional attitude in negotiations for his services and should decline to submit competitive bids for professional services, to furnish bonds for satisfactory performance, or to guarantee estimates.

# Building Conditions in the United States

Prepared by S. W. Straus & Company

## New York Gains While Other Cities Lose

**B**UILDING permits issued throughout the country in May were of larger volume than for any previous May in the nation's building history. Reports from 328 leading cities and towns show a total of \$332,189,270, compared with \$307,882,746, in May, 1923, a gain of 8 per cent.

New York City showed a gain of \$25,000,000, and a few other large cities reported substantial gains, but many large cities showed losses and there were heavy losses in the majority of the smaller cities and towns. Every section of the country, in fact, showed a loss over May, 1923, with exception of the eastern section, where the sectional gain was due entirely to the increase in

volume of plans filed in Greater New York.

It is apparent that the greatest building activity is still confined to the larger cities, and many of these are in the East. The Pacific Western cities, which have been booming for some time past, showed a loss in May of 25 per cent. In 109 Central cities the volume this May was approximately the same as in May, 1923, and in 57 Southern cities there was a loss this May of a little more than a million dollars.

Despite these losses in various cities which had been showing monthly gains, the volume of building was still greater than in any previous May, taking the country as a whole.

TWENTY-FIVE CITIES SHOWING LARGEST VOLUME OF PERMITS  
FOR MAY, 1924, WITH COMPARISONS

|                      | May, 1924     | May, 1923     | May, 1922     | April, 1924   |
|----------------------|---------------|---------------|---------------|---------------|
| 1. New York, P. F.   | \$65,377,437  | \$39,921,594  | \$42,511,261  | \$48,904,589  |
| 2. Chicago           | 16,791,708    | 12,976,761    | 14,153,100    | 20,128,862    |
| 3. Detroit           | 16,790,708    | 12,976,761    | 14,153,100    | 20,128,862    |
| 4. Philadelphia      | 10,940,375    | 12,709,660    | 8,872,050     | 18,946,260    |
| 5. Los Angeles       | 8,780,932     | 18,926,881    | 9,327,504     | 13,224,568    |
| 6. Cleveland         | 6,802,250     | 4,619,075     | 6,755,900     | 5,154,450     |
| 7. Baltimore         | 6,287,000     | 3,879,005     | 4,237,560     | 4,551,840     |
| 8. San Francisco     | 5,478,111     | 4,928,986     | 4,377,066     | 5,036,673     |
| 9. Washington, D. C. | 4,762,445     | 2,793,951     | 4,994,223     | 3,408,130     |
| 10. Seattle          | 4,758,170     | 1,867,280     | 1,643,030     | 2,329,805     |
| 11. Newark, N. J.    | 4,328,075     | 3,141,039     | 3,258,406     | 3,171,655     |
| 12. Milwaukee        | 4,220,734     | 4,715,441     | 2,447,709     | 4,998,903     |
| 13. St. Louis        | 4,140,850     | 4,160,386     | 2,396,880     | 2,810,065     |
| 14. Boston, P. F.    | 4,103,790     | 4,584,781     | 4,258,050     | 5,472,551     |
| 15. Pittsburgh       | 3,325,016     | 3,017,904     | 3,637,013     | 3,584,333     |
| 16. Denver           | 3,065,650     | 3,024,800     | 2,795,000     | 2,416,650     |
| 17. Cincinnati       | 3,002,515     | 2,380,075     | 3,227,880     | 4,117,375     |
| 18. Hartford         | 2,894,465     | 603,482       | 2,460,385     | 1,833,613     |
| 19. Providence       | 2,823,500     | 3,495,400     | 2,252,500     | 2,618,500     |
| 20. Dallas           | 2,725,580     | 1,894,824     | 1,388,355     | 2,221,390     |
| 21. Buffalo          | 2,656,000     | 2,847,000     | 2,224,000     | 2,531,000     |
| 22. Portland, Ore.   | 2,535,760     | 2,594,620     | 2,916,755     | 2,519,275     |
| 23. St. Paul         | 2,524,815     | 2,733,690     | 3,073,758     | 1,458,278     |
| 24. Minneapolis      | 2,506,410     | 4,039,440     | 3,780,010     | 3,221,480     |
| 25. Oakland, Calif.  | 2,241,383     | 2,373,020     | 2,243,745     | 2,457,592     |
|                      | \$209,739,066 | \$180,433,785 | \$166,163,790 | \$200,601,392 |

NOTE.—P. F. after cities indicates figures are for "Plans Filed" instead of "Permits Issued."

SUMMARY OF MAY REPORTS BY REGIONS

| No. Cities | Regions | May, 1924     | May, 1923     | April, 1924   |
|------------|---------|---------------|---------------|---------------|
| 94         | East    | \$150,582,584 | \$117,424,741 | \$139,534,047 |
| 109        | Central | 116,303,023   | 116,439,635   | 125,103,465   |
| 57         | South   | 20,652,282    | 27,243,930    | 33,691,510    |
| 68         | West    | 38,651,381    | 46,774,440    | 41,732,804    |
| 328        |         | \$332,189,270 | \$307,882,746 | \$340,061,826 |

## Original 66 Types of Paving Brick Now Reduced to Five

**F**OLLOWING is a list of officially recognized types and sizes of paving brick as adopted by the Permanent Committee on Simplification and Varieties and Standards of Vitrified Paving Brick of the United States Department of Commerce at its meeting held on March 28, 1924. The table also gives the respective percentage of total shipments represented by each type and size:

| Plain wire-cut brick (vertical fibre lugless) | (Sizes in Inches)          |        |        | Per Cent of Total Shipments in 1923 |
|---|----------------------------|--------|--------|-------------------------------------|
|   | Width<br>(As usually laid) | Depth  | Length |                                     |
|   | 4" x 3"                    | 3 1/2" | 8 1/2" | 38.8%                               |
|   | 4" x 3 1/2"                | 3"     | 8 1/2" | 13.7%                               |
| Wire-cut lug brick (Dunn)                     | 3 1/2" x 3"                | 3"     | 8 1/2" | 2.3%                                |
|   | 3 1/2" x 4"                | 4"     | 8 1/2" | 6.4%                                |
| Repressed lug brick                           | 3 1/2" x 4"                | 4"     | 8 1/2" | 18.3%                               |

## Select Contractors with Care

Engineer Urges Cost Plus Plan Rather Than Lump Sum Agreement

By Thomas C. Desmond

President, T. C. Desmond & Co., Inc., New York City

**A**FTER the plans for a house have been prepared—let us hope with the help of a competent architect—and the finances arranged, the next step, and in many ways the most important one, is the choice of a contractor. In almost any town there are two or three contractors who stand out preeminently for technical ability and integrity of character.

One of them should be selected by the owner with the assistance of the architect, if possible, and a contract, providing for payment to the contractor of the actual cost of labor and material used on the house plus a fixed fee allowance to cover the contractor's overhead office expenses, supervision and profit, entered into. A reasonable amount for the fixed fee allowance would be 8 to 15 per cent of the estimated total cost of the house, depending somewhat on its neighborhood, the anticipated difficulties in supervision, the size of the house, etc. Larger houses can be built for a lower percentage, and smaller ones require, in fairness to the contractor, a higher percentage.

The recommendation of a cost plus fixed fee form of contract for the building of a small house will arouse probably a chorus of disapproval from architects and other people accustomed to the old style of gambling lump sum contracts, which have been responsible for so much evil in construction work for generations. The wise owner, however, who chooses a reliable contractor and places himself in the hands of that contractor, trusting the contractor as he does his architect, doctor, lawyer, et al., should obtain ultimately a better house and for less than owners who do otherwise.

That form of contract, although unusual and new in the building of small homes, is being adopted gradually in many cities for the building of important buildings. Many of the most efficient corporations in the United States use that form of contract in the constructing of monumental buildings, choosing their general contractor almost entirely on the basis of his reputation, as they choose their lawyers and other professional experts. The small local contractors of the United States in any particular district have among them men of just as high character and technical ability in their line as are to be found in any other business, and it is easy to discover in any neighborhood who of them are entirely worthy of trust.

With a contract of that form, no difficulties should arise after the work has started in regard

to changes in the house, extras, substitutions of material, etc., which are the bane of gambling lump sum contracts. From the time the contract is signed, the interests of the contractor are almost identical with those of the owner. Although the money of the contractor may not be at stake, as he is taking little financial risk, his professional reputation is on trial, and with contractors that can be as strong an inducement to render satisfactory service as it is with lawyers, doctors and other technical professional men.

From the very start of the contract, the owner will have the great benefit of the disinterested advice of the contractor in regard to possible advisable changes in the plans and specifications. That does not mean that the contractor necessarily will criticize or come in conflict with the architect, but it does mean that instead of its being to the immediate financial interest of the contractor to deceive the owner and architect by putting in inferior materials and workmanship, the contractor is stimulated to cooperate with owner and architect for the best interests of all concerned. That is not always true in lump sum gambling contracts, and too many unfortunate owners know already that on such contracts the contractor, who is in this business constantly while the owner is having his first experience, can outwit, if necessary, the foolish owner, who is in the position of trying to beat the other man at his own game.

The fact that a contractor under a cost plus fixed fee form of contract does not guarantee the ultimate cost of the house is no objection whatever. There are too many ways, which all unscrupulous contractors know, of evading obligations of a lump sum contract when the contract is not proceeding to their satisfaction, to give unquestionable value to such alleged guarantees. I should feel much safer any time in building a home with a carefully prepared and honorable estimate from a reliable general contractor than with an apparent lump sum guarantee from an inferior contractor, chosen principally on account of low price offered, whether or not accompanied by a surety bond. Surety bonds are expensive and they are really of little avail when trouble comes to an owner from the employment of a bad contractor. That is no reflection on the surety companies, but if you pick out a reliable contractor to start with and trust him on a cost plus fixed fee contract, you can well omit the expense of a surety bond.

—The New York Sun.

### THE EFFECT OF CHANGES IN HIGHWAY SPECIFICATIONS

The United States is now carrying on a highway improvement program which, measured in terms of expenditures, approximates a billion dollars annually. As in nearly everything else of concern to the general public, we have gone in for quantity production. A large yearly mileage of new roadways has been demanded, that a place might be found upon which to operate the quantity production of the motor vehicle. So large are the annual programs of new construction in many states that even minor modifications in specifications or designs have a very large financial aspect.—Thomas H. MacDonald, Chief of the U. S. Bureau of Public Roads.

## Manufacturers ---- Distributors ---- Consumers

Published under the auspices of the Associated Equipment  
Distributors, Sixteenth Street Viaduct, Milwaukee, Wisconsin

### Price Cutting---The Reasons and the Consequences

By H. G. Ferris

President, Hofius-Ferris Equipment Company, Spokane, Washington

I HAVE often tried to analyze the mental attitude of contractors who habitually attempt to force salesmen to cut prices. It seems that there are three classes of men who are included in this grouping. On the one hand, there is the man who understands little of business and less of overhead, and who is a non-success in his own business, and concludes that price cutting is a wise and shrewd proceeding. This class of man frequently represents a foreign element, having originated in a country that still bears the characteristics of many countries of Europe and the rug merchants of Bagdad, who conclude that a sale or a purchase is never properly consummated until the prices have been hacked and cut to pieces. The second class of men who use this method of buying are those who believe it is good business, and that it is shrewd, and who, through ignorance, believe that they are thereby the gainers. Falling under the third heading might be a long list of purchasing agents who have been placed in the capacity of "buyers" on account of their reputation for shrewdness and economical purchasing.

When purchasing agents are supported by an accurate and intelligent engineering force to guide them and permit this practice only in cases where a product has passed a high competitive test of efficiency, it is not so objectionable or detrimental to their interests, but, peculiar as it may seem, the different men under these groups are all losing eventually. Both physical and mental standards to-day admit that something cannot be purchased without paying the price, and that if the price is not paid, something else is purchased and full value is rarely received.

During many years' experience and in close contact with every class of buyer and contractor, many instances have occurred to bear out the absolute truth of these statements, and yet we shall always have with us this persistent and thoughtless type of buyer. Their numbers are lessening, true. Among business men and intelligent classes of buyers the question of price cutting is seldom an important issue, and there will be fewer in this group as soon as they begin to analyze the results.

It is useless to deny that self-preservation demands that every one of us, when we purchase on the open market, use care, intelligence and good judgment and it is also needless to deny that in many cases forcing a price reduction is admissible; but, unfortunately, in a majority of cases it is done with the reprehensible and single thought in mind of beating down the legitimate profit and attempting to get full value in equipment for less

than its fair value.

In the contracting business and with construction equipment distributors the margin of profit is so small as compared with other retail and wholesale projects that when a price is cut on a legitimate, standard article a search for the reason will usually reveal either stagnant conditions of the factory, surplus stock which they are forced to unload, or unscrupulous distributors. Most factories selling construction equipment establish their selling prices, and from this they allow their distributors certain discounts, these discounts usually being nominal. A large number of manufacturers, however, building an article of similar, general type, but of greatly inferior design and construction, will capitalize on this by advancing their selling prices to equal the price of a finer commodity, then deliberately give their sales agents an excessive commission. The contractor, unless he is able to discriminate between the mechanical values, is fooled into believing, perhaps, through reading advertisements, that both machines are equal in value, and when the unscrupulous distributor starts cutting, the contractor gleefully comes to the wrong conclusion that he has purchased something under the market. The usual results are that on the most important part of the job when his machine breaks down he will wake up to a realization that he received just what he paid for and that he did not fool anyone but himself.

Many amusing and almost pitiful instances of contractors being duped through their own greediness are daily being revealed to us in our negotiations with the contracting trade. One such incident occurred recently to an eastern member of the Associated Equipment Distributors through the call of a contractor, who apparently came into the distributor's office with the desire of purchasing a newer type of multi-cylinder gas engine to run an under-powered concrete mixer he owned. As it happened, the distributor knew that this man had purchased a much cheaper and less efficient type of mixer about three and one-half months previously, and that they had lost this order because their original bid was higher. It developed in talking with the contractor that the mixer he had purchased had 2 h. p. less and a cheaper make of engine than was included on the machine of this distributor, whose price had been high; that the speed of the drum was 8 to 10 revolutions slower, and that the best he could do was to take a batch out of it about every 4½ minutes. The contractor, feeling rather sheepish, was big enough, however, mentally to admit that he had



made a mistake; but now that he had bought the machine he was distressed at the idea of throwing it away, so he suggested that he would buy from this distributor a larger engine and speed up the drum, try to finish this season out with it, and buy a new and better machine next year.

The contractor further, in an apologetic way, suggested that the principal reason he had given the order to the competitor was because the competitor had offered him \$350 in trade for an old, obsolete machine that he had owned for four years. As it happened, the member distributor also had an opportunity at the time to bid on the old machine, but he refused to make an allowance because of its "junk" condition. The contractor, in admitting his reason, revealed the price he had paid. The moral of the incident is that the unscrupulous salesman who secured the order had accomplished it by deceit in "jacking" or raising the regular selling price \$250 higher, and then upon being asked his selling price and allowance figure, by the contractor, he allowed him \$350 for his old machine. Our member distributor naturally did not inform the contractor how he had been deceived, as it would hardly have been an ethical statement.

Another instance, from this same distributor, that is not two weeks old at the publishing of this article, shows that a certain irresponsible distributor, carrying accounts on a commission basis, sold a contractor a certain piece of equipment for \$2,000 more than he could have purchased it from any other distributor of the same equipment. This contractor who was "stung" \$2,000 could have purchased a finer machine, in every way superior in efficiency and details of design and construction, for about \$2,600 less than he paid.

An established, responsible distributor, in the first place, would naturally not have been a party to a deception of this kind, and, in the second, could not afford to do it, as it would have jeopardized the standing of his established business, his capitalization and his future. On the other hand, the irresponsible distributor had nothing to lose and everything to gain by making this sale by any method, unmindful of the consequences, because this type of salesman can as a rule profit by P. T. Barnum's saying that "there is a fool born every minute," and can usually find enough "fools" to keep him busy without repeat orders.

I can personally illustrate this point, in the closing argument, by a concrete paver sale in which the customer was choosing among three

well-known and successful machines. One was represented by a local equipment house having a large investment in equipment repair parts, a shop and service department; besides this, they had a record of continuous existence and bore a reputation for honesty and fair dealing. The other machines were represented by agents with a corresponding low overhead expense, and although they represented good machines, they had no service to offer other than a promise of fair adjustment on anything that was not right. In desperation the traveling salesman offered to make a decided cut in their prices rather than lose out. This was a fine club for the contractor, and he quickly used it on the established dealer, whose comeback was like this:

"John, you are buying a machine the success of which could make or break this job. You are buying a machine expecting continuous service. You probably expect the fullest cooperation from the man who sells the machine to give you maximum results from the paver."

"You bet," was the reply.

"John, you are foolish to let any one cut his commission on this sale. What interest in giving full measure do you feel on a job if the engineer or inspector has talked you out of your profit? No, John, we are human and will do more for you day or night if we have made a good, clean sale, and you could better afford to pay us more than we ask than to let us cut the price."

The Associated Equipment Distributor got the order on the full price and the other salesman still thinks it was sold by a cut in price.

The sequel of this sale was that in the height of the contract his paver operator "walked out." The distributor, through his efficient organization, was able to replace him with a better man within four hours and also give the contractor efficient and prompt service in innumerable cases, by having experienced mechanics available.

Unknown to many contractors, the margin of profit in the construction equipment business is small. The net profit in the business itself, by a census of the largest and best organizations in the country, ranges from  $3\frac{1}{2}$  to 6 per cent net.

If a contractor will stop to think for a minute, he will realize that the distributor cannot cut fair selling prices that are maintained and give to the buyer loyalty, respect and service, and all of these three elements are so important that the contractor should take pride in relying on his distributor for these characteristics.

## Trade Notes

### Lenher Handling New Account

THE Lenher Engineering Company, 95 Liberty Street, New York City, which for 20 years has been the sales agent for S. Flory Manufacturing Company, Bangor, Pa., has recently been appointed Eastern Sales Agent for the Bay City Foundry & Machine Company, Bay City, Mich., manufacturers of power-driven winches, capstans and cranes for motor trucks. The Lenher Engineering Company continues its representation of the Flory Company, and has added to its staff engineering salesmen who will specialize on the winch equipment for motor trucks.

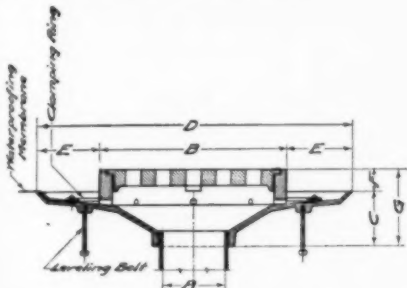
### Promotions in Bucyrus Company

THE Bucyrus Company, of South Milwaukee, Wis., has announced the following promotions: G. A. Morison, Secretary and Sales Manager, has been appointed Second Vice-President in Charge of Sales, in addition to his title of Secretary; D. P. Eells, Treasurer and Manager of Foreign and Export Department, has been appointed Second Vice-President in Charge of Foreign and Export Department, in addition to his title of Treasurer; William Bager, Chief Engineer, was appointed Second Vice-President in Charge of Engineering.

# Railroad and Highway Deck Drains

A Series of Drains for Use Where Waterproofing Is Necessary

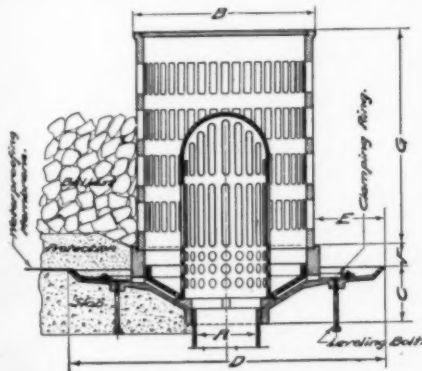
THE fundamental requirements for railroad drains are: first, provision for run-off at the waterproofing blanket, as well as at the surface; second, the means of connection should be positive and ample to insure a complete seal; third, all elements of the drain must act to prevent clogging; they should be accessible and easy to clean, always providing ample drainage opening for free flow to the drain outlet.



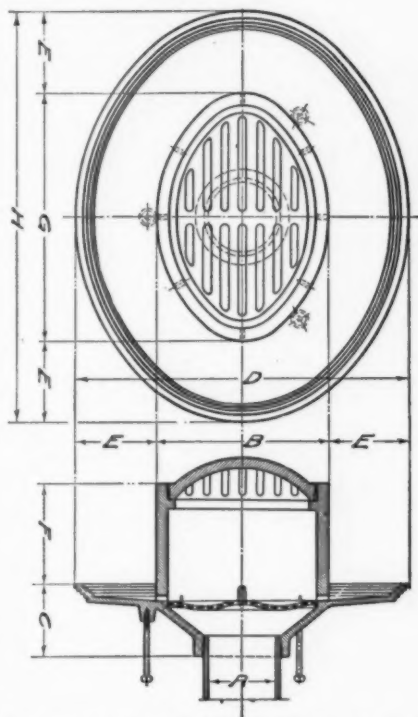
THIS STURDY DRAIN IS THE BASIS FOR THAT SHOWN BELOW

In the Josam-Minwax railroad and highway deck drains, made by the Josam Manufacturing Company, Michigan City, Ind., in cooperation with the Minwax Company, 327 South La Salle Street, Chicago, Ill., certain modifications have been incorporated in the standard Josam design to increase effectiveness in waterproofing and to enable the adaptation of a single unit to the demands of varying types of construction.

One of the flat types of drains, No. 0513D, is made of heavy cast iron, extremely rugged in construction to withstand rough handling. The extra-wide flange, as illustrated, and the flashing ring insure good connections and make a lead flange unnecessary. The height of the rim,  $1\frac{1}{2}$  inches, provides a stop for the protection course,



SAME DRAIN WITH BALLAST GUARD AND REMOVABLE SEDIMENT CUP



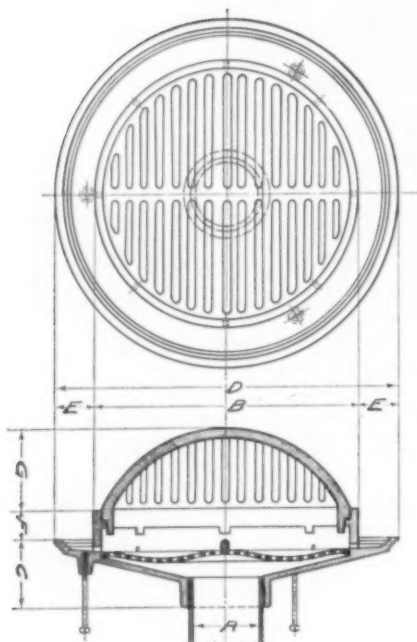
AN OVAL DRAIN FOR PAVED DECKS AND HIGHWAYS

the minimum for which should be  $1\frac{1}{2}$  inches, and the double drainage properly provides the run-off at the level of the waterproofing blanket. Three leveling bolts are provided, for ease in setting and leveling the drain in the forms.

This drain forms a basis for all Josam-Minwax railroad drains, the dimensions being changed to meet varying conditions. It can be used for floor work or where the finished surface is the top of the protection course—in this case a flat or dome-shaped cover is placed on it.

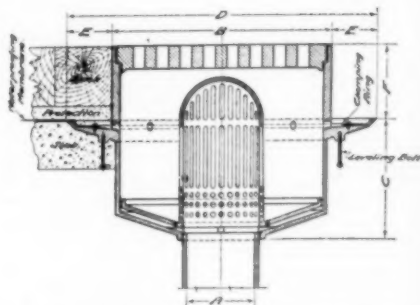
The No. 0513 drain with ballast guard and removable sediment cup is designed for ballasted railroad bridges. The ballast guard is a heavy cast-iron cylinder, perforated with slots, which drain the entire depth of the ballast but keep heavy material out of the drain. It has a solid cover fastened by screws, but removable. The sediment cup is loose in the drain and catches all fine material, preventing clogging of the pipe, and can be removed and dumped at suitable intervals. Ballast guards are made in varying depths from 14 to 20 inches. The smallest has a diameter of 12 inches to permit placing between ties.

The No. 050 drain is adapted to paved decks or highways. Since it is oval in form, it is also adaptable for use in railroad track construction,



A ROUND DRAIN FOR SHALLOW CONSTRUCTION, MADE WITH CROWNED OR FLAT GRATE

permitting it to be placed between the ties and where depth for ballast is needed to bring the drain opening level with the surface. Three level-



A DECK DRAIN FOR PAVED HIGHWAYS, VIADUCTS AND BRIDGE CONSTRUCTION

ing bolts are provided for setting and leveling the drain in the forms.

The No. 051 drain is round in form and designed to meet shallower construction. It can be used for floor work or where the finished surface is the top of the protection course, and is made with either crowned or flat grate. It is rugged in construction and is of large capacity for the removal of water.

The No. 0523 drain is particularly adapted to paved highways, viaducts and bridge construction. It provides greater height above the level of the waterproofing blanket for the protection course and the pavement. The height is variable to meet requirements. The particular type illustrated provides also for sufficient depth of body for a sediment cup to prevent clogging, and permits easy clean-out. This drain can be modified to omit the sediment cup, or otherwise to meet the requirement of curb, or other special conditions which may arise in either railroad or highway bridge construction.

## A Study of Building Costs

Second Annual Volume Prepared by William J. Moore, President, American Bond and Mortgage Company, Shows Why Costs Don't Come Down

IN the second annual "Study of Building Costs and Rental Returns," prepared by William Moore, President of the American Bond Mortgage Company, Chicago, Ill., the point is made that with \$8,000,000,000 of needed construction to be completed, to which can be added \$2,000,000,000 of delayed public construction, and with the capacity of the country for building not more than \$5,000,000,000 yearly at most, at the end of 1924 there will be at least \$5,000,000,000 of required construction still to be done.

The shortage of skilled building mechanics, averaging almost 50 per cent in the case of lathers, plasterers, masons and sheet-steel workers, together with the advancing age of skilled building mechanics—more than 40 per cent of the carpenters, plasterers, painters and brick and stone masons being above the age of 45 years—warrants the conclusion that labor costs in the building industry will be maintained at approximately present levels.

The survey contains many charts showing the stabilization in prices of building materials and

likewise the maintenance of living costs, all pointing to the establishing of general construction costs at present levels.

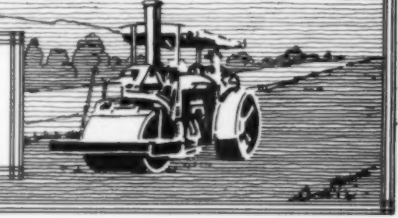
A special charting of building construction costs during the past 25 years, made by this company, indicates an average increase per year in the pre-war normal cost trend of about 3 per cent. This means that the average cost should have been almost 150 per cent in 1924 as against 70 per cent in 1898. Therefore, the return to 1913 cost levels is regarded as improbable and until the housing shortage is completely made up, a reduction to even the average post-war percentage of increased costs can scarcely be contemplated.

The following table shows the building construction required for 1924, based on information from chambers of commerce by the *Building Age*:

| Type of Building | Number  | Value           |
|------------------|---------|-----------------|
| Residences ..... | 669,633 | \$3,665,779,000 |
| Apartments ..... | 29,445  | 1,720,519,000   |
| Schools .....    | 3,082   | 428,112,000     |
| Hospitals .....  | 1,411   | 143,473,000     |
| Theaters .....   | 1,559   | 112,657,000     |
| Hotels .....     | 3,118   | 344,013,000     |

# Catalogs for Contractors

The catalogs and pamphlets listed below are available for free distribution. Contractors and Engineers who check over these pages each month and write for such material as interests them, will find this a valuable means of keeping up-to-date on the subject of machinery and equipment.



## HEAVY ROCK EXCAVATION

Catalog B-45 issued by the Sanderson-Cyclone Drill Co., Orrville, Ohio, describes Cyclone big blast hole drills and their application to quarry service and heavy rock excavation.

## A BALANCED PAVER

The Ransome Concrete Machinery Co., 1750 Second St., Dunellen, N. J., will be pleased to send literature describing its 21-E balanced paver to any contractor interested in a well-built, simply operated concrete mixer.

## A PNEUMATIC CLAY-DIGGING SPADE

The Sullivan compressed air spader, which more than doubles the output of a man working in clay, is described in detail in Bulletin 70-X issued by the Sullivan Machinery Co., 122 S. Michigan Ave., Chicago, Ill.

## A HANDY CENTRIFUGAL PUMP UNIT

The Evinrude centrifugal pump, which is a particularly handy outfit for unwatering trenches and flooded cellars, and which can operate either from the bank or from the pit, is described in the literature of the Evinrude Motor Co., Milwaukee, Wis.

## A NEW PRECISE TRANSIT FOR EVERY-DAY USE

W. & L. E. Gurley, Troy, N. Y., have just brought out a new precise transit, achieving theodolite accuracy in an every-day working transit. This instrument is described in literature which may be secured free on request by interested engineers.

## PORTABLE ASPHALT PLANTS

The Merriman one-car asphalt melting plant with a guaranteed capacity of 2,250 yards a day, and the Mosher two-unit portable road asphalt plant having a capacity of 1,800 yards per day, are described in the illustrated literature of the East Iron and Machine Co., Lima, Ohio.

## A ONE-PIECE CONVEYOR, CRUSHER AND SCREEN

The Iowa Mfg. Co., Cedar Rapids, Ia., has developed the "Cedar Rapids One-Piece Outfit," which in one operation takes the material from a gravel-pit or quarry ledge, crushes, screens and delivers the finished product direct to storage or loading bin. This machine is described in the illustrated literature of this company.

## ADJUSTABLE SHORES FOR CONTRACTORS

The Rooshor, which is self-locking and adjustable and which is claimed to save many times its cost on building jobs through obviating cutting up good lumber for shoring, is described in the literature of the H. W. Roos Co., 2036-2046 Dana Ave., Cincinnati, Ohio.

## SELF-LOADING FOUR-WHEELED SCRAPERS

Tractor-drawn models of Baker-Maney self-loading four-wheel scrapers are described and illustrated in their many uses in Catalog No. 209 recently issued by the Baker Mfg. Co., 585 Stanford Ave., Springfield, Ill.

## FRESNO, DRAG AND WHEELED SCRAPERS

Catalog No. 42, issued by the Sydney Steel Scraper Co., Sydney, Ohio, describes this company's complete line of Fresno, drag and wheeled scrapers, wheel-barrows and grading plows for contractors.

## INDUSTRIAL BUNKS FOR CONSTRUCTION CAMPS

The Southern-Rome Co., Baltimore, Md., has issued an illustrated catalog describing Romeling industrial bunks, which are used very extensively by contractors in construction camps.

## A SUCCESSFUL CAR UNLOADER

The Sanbury car unloader or loader, which has an unusually small number of moving parts and which may be easily erected and dismantled for transporting from job to job, is described in detail in literature of the Sanbury Mfg. Co., Sanbury, Ohio.

## A NEW TRANSMISSION FOR FORD TRUCKS

The Warford auxiliary transmission for Ford trucks greatly increases the available power of the sturdy Ford engine and makes it possible to drive through any kind of road. Illustrated information regarding Warford transmissions may be secured from the Warford Corp., 44 Whitehall St., New York City.

## SPEEDY BATCHES FOR CONCRETE AGGREGATES

The experience of 625 installations of Blaw-Knox batchers, which quickly and with a saving of labor accurately measure sand and stone for concrete central proportioning plants, are described completely in the illustrated literature of the Blaw-Knox Co., 667 Farmers Bank Bldg., Pittsburgh, Pa.

## TRUCKS THAT PULL ON BAD ROADS

GMC trucks offer remarkable efficiency in every field of hauling service. When extra power is necessary to move an exceptionally heavy load or when grades and heavy hauling call for an extra pull, it is claimed that the GMC truck can supply the surplus power necessary. All the special features of GMC design and construction are given in a brief illustrated booklet which may be secured by any interested contractor from the General Motors Truck Co., Dept. 49, Pontiac, Mich.

## A CONTRACTORS' TAR AND ASPHALT HEATER

Bulletin A-1 issued by Littleford Bros., 500 E. Pearl St., Cincinnati, Ohio, describes the Littleford No. 48 contractor's special tar and asphalt heater, made of heavy steel plates with a kettle entirely within the furnace shell and heavily welded and leak-proof. It is equipped with a large draw-off valve, two charging doors and renewable grate-bars.

## LONG-LIVED CONCRETE MIXERS

Jaeger mixers, which are popular with contractors and which are claimed to be able to stand up for many years, giving honest service at low operating cost, are described in the literature of the Jaeger Machine Co., 701 Dublin Ave., Columbus, Ohio. These mixers can be used for mixing concrete, mortar or plaster, and thus help to keep down building costs.

## A BALANCED AUTOMATIC DUMP BODY

The Easton roll-over body, which is perfectly balanced, dumps automatically and rights itself, thus saving the driver's time, is described in detail in Bulletin 32 and 33 issued by the Easton Car & Construction Co., Easton, Pa.

## WATER-METER SETTINGS

Ford water-meter settings are made in types for every climate, with single- or double-lid cover, scientifically designed, to afford adequate protection from frost. These lids have the Ford worm lock, which is positive and automatically lifts the lid with the unlocking action, breaking the seal of ice or dirt. These boxes are described in detail in the literature of the Ford Meter Box Co., Wabash, Ind.

## SIDEWALK INSURANCE 2 CENTS PER YARD

The average contract for sidewalk construction is about \$2.25 per square yard. The cost of Elastis expansion joints averages about 2 cents per square yard. This expansion joint, which saves the wrecking of the job during hot weather, is described in the literature of the Philip Carey Co., 9 Wayne Ave., Lockland, Cincinnati, Ohio.

## ROAD-BUILDING EQUIPMENT

Bulletin 43 published by the Koppel Industrial Car & Equipment Co., Koppel, Pa., describes this company's complete line of industrial railway road-building equipment, including road trucks, and batch boxers which are designed and constructed to stand the strain of road-building service.



**PORTABLE ASPHALT PLANT**

The new redesigned Iroquois three-unit asphalt mixing plant is said to be far exceeding in actual practice its guaranteed capacity of 1,250 square yards of 2-inch sheet asphalt per day. This machine, which has a 12-ton bin, a 1,000-pound batch mixer and an improved air-lift from the melting tank to the weigh bucket, an automatic valve shut-off, heavy drum housing and a single or double cold material elevator, is described in detail in the literature of the Barber Asphalt Co., Land Title Bldg., Philadelphia, Pa.

**A GASOLINE CRANE ELEVATOR**

Bulletin C. E.-6 issued by the Koehring Co., Milwaukee, Wis., describes the Koehring crane excavator, which is designed for gasoline power, not merely powered with a gas engine.

**A FLEXIBLE POWER-PLANT FOR CONTRACTORS**

Hercules engines, which are built to stand the hardest service and which generate the full rated horsepower, are described in the literature of the Hercules Corp., Engine Div. B, Evansville, Ind.

**TRACTORS VS. MULES**

The C. L. Best Tractor Co., San Leandro, Calif., in its illustrated literature gives a wealth of information regarding these tractors, which operate at about one-quarter the cost of mules.

**HEAVY-DUTY MOTOR TRUCKS**

In the literature of the International Motor Co., 25 Broadway, New York City, contractors will find detailed information regarding heavy-duty 1½- to 7½-ton trucks and tractors up to 15-ton capacity, all capable of handling the heavy hauling jobs which occur frequently in contracting work.

**A PORTABLE ASPHALT PAVING PLANT**

The Farasey portable asphalt paving plant, which is made by the J. D. Farasey Mfg. Co., E. 37 St. & Erie R. R., Cleveland, Ohio, and which is mounted on a railway flat car, is described in detail in literature of this company. This outfit will dry and mix material for 2,250 yards of 2-inch asphalt surface per 8-hour day.

**A SHOVEL CRANE OF MANY USES**

The Osgood ¾-yard traction steam shovel and crane has proved a remarkably versatile machine. It has been used by contractors on all kinds of jobs with satisfaction. It is described in detail in the literature of the Osgood Co., Marion, Ohio.

**A NATURAL UNIFORM ASPHALT ROAD**

Kentucky rock asphalt, which has been made by nature as a perfectly uniform product, the mineral aggregate of which is a pure silica sand, sharp and angular, and the binder of which is a high-grade bitumen, is a product to be considered by contractors in bidding on asphalt roads. Brochure CEM, which may be secured from the Kentucky Rock Asphalt Co., Inc., 711-718 Marion E. Taylor Bldg., Louisville, Ky., tells the complete story.

**AN OUTSTANDING ONE-TON TRUCK**

It is claimed that 78 per cent of all trucks in the 1-ton class are Fords. Information regarding the complete line of Ford 1-ton trucks, of interest to contractors, may be secured from the Sales Dept., Ford Motor Co., Detroit, Mich.

**REASONABLY PRICED MIXERS**

Packard tilting mixers, which trail behind any machine, Boss heavy-duty mixers, Boss alley paving and building mixers, the Ford skid mixer, Boss hoist and gasoline engines, are described in literature which may be secured from the American Cement Machine Co., Inc., Keokuk, Iowa.

**STREETS THAT STAY YOUNG**

Tarvia streets are known the length and breadth of the United States as economical and long-lived. Complete information regarding any kind of Tarvia pavements and how they are laid successfully may be secured from the Barrett Co., Tarvia Dept., 40 Rector St., New York City.

**ONE-HALF-BAG TO THREE-BAG MIXERS**

Wonder mixers, which are built in sizes that meet every need of the contractor, ranging from one-half bag per batch size up to and including a three-bag capacity mixer, are described in the literature of the American Construction Machinery Co., Dinton St., Waterloo, Iowa.

**GAS ENGINES WITH SERVICE RECORDS**

The literature of the Climax Engineering Co., 1 West 18th St., Clinton, Iowa, describes the Climax engine, which has many remarkable service records handling jobs for contractors. A list of manufacturers of contractors' machinery using Climax engines as standard equipment will be furnished free on request to any contractor interested.

**DIRT-MOVING MACHINERY**

Patrol road machines, large and small graders, scarifiers, planners, finishers, extra cutting edges, elevator graders, dump-wagons, road-draws, Fresno scrapers and other dirt- and gravel-moving machinery for road work, are described in the latest illustrated catalog of the Russell Grader Mfg. Co., Minneapolis, Minn.

**PUMPING UNSCREENED SEWAGE**

The pumping of trash, sewage and storm water without the use of screens, is readily accomplished with Wood trash pumps, which are described in Bulletin B-1, which may be secured from the Ellicott Machine Corp., 1111 Bush St., Baltimore, Md.

**TRENCH-DIGGING EQUIPMENT**

P & H trench excavators which are ready for immediate shipment and which make the dirt fly when once on the job are described in Catalog 16-X issued by the Excavating Machinery Div., Pawling & Harnischfeger Co., 3819 National Ave., Milwaukee, Wis. The wheel type is made for trenches up to 7½-feet deep, and the ladder type for deeper trenches to 18-feet deep.

**A TWO-WAY TRUCK**

A truck which has five speeds forward and five speeds backward and which can be driven with equal facility in both directions, the driver always facing in the direction in which the truck operates, is described in detail in the literature of the O'Connell Motor Truck Co., Waukegan, Ill., which has designed this truck especially for road builders to eliminate turning between the forms of road operation.

**A FLOOR-SURFACING MACHINE FOR BUILDERS**

The American Floor Surfacing Machine Co., 518 E. St., St. Clair St., Toledo, Ohio, will be pleased to send its illustrated literature describing the work of its machine which solves the labor problem in producing a smooth, uniform floor surface. This machine enables one man to do the work of six.

**CHEAP PUMPING FOR TRENCHES**

Bulletin 24-TC issued by the Domestic Engine & Pump Co., Shippensburg, Pa., describes Domestic pumping units, which are recommended for pumping out flooded foundation excavations, trenches, ditches, sewers and caissons.

**REPLACEMENT UNITS FOR FORD TRUCKS**

Replacement power-plants, transmissions, manifolds and power take-offs for Ford cars and trucks, are described in the literature of Hinkley Motors, Inc., Detroit, Mich.

**CONCRETE ROADS IN HALF THE TIME**

Labor-saving in curing concrete roads, and speeding up the time of opening are two of the particular advantages of using Dowflake calcium chloride, as described in the literature of the Dow Chemical Co., Midland, Mich.

**STEEL TREADS FOR WOODEN BRIDGE FLOORS**

Bridge engineers and city and county officials have found that the use of "A. W." diamond-pattern rolled-steel traffic treads on wooden bridge floors have greatly increased the lives of the bridge floors and give safety. These treads are described in detail in literature which may be secured from the Alan Wood Iron & Steel Co., Widener Bldg., Philadelphia, Pa.

**FULL-STRENGTH CEMENT IN 24 HOURS**

The Atlas Lumnite Cement Co., 25 Broadway, New York City, manufacturers of a high alumina cement which develops at 24 hours a greater strength than that of Portland cement at 28 days, will be pleased to send to any interested officials or contractors complete information regarding its economical uses.

**A WELL-PLANNED PORTABLE BELT CONVEYOR**

The Austin-Western Road Machinery Co., 400 N. Michigan Ave., Chicago, Ill., will be pleased to send you its literature describing the new carefully planned and well-built Austin portable belt conveyor, which is made up with either gas-engine or electric-motor drive.

**WATER-WORKS EQUIPMENT**

Catalog 24 just issued by the H. W. Clark Co., Mattoon, Ill., illustrates and describes this company's remarkably complete line of water-works equipment, including meter-boxes, meter-box forms, test cocks, service boxes, pipe vices, meter-testing machines, leak indicators, pipe locators, tank and reservoir gages and recording gages.

**A HELPFUL BOOKLET**

The Truscon Steel Co., Youngstown, Ohio, has just issued a booklet, "Beautiful and Permanent Walls and Ceilings Are the Body of Architectural Excellence." This booklet calls attention to the advantages of Truscon I-A metal lath and expanded corner bead in the elimination of cracks, streaks and other rapid deterioration in plaster.

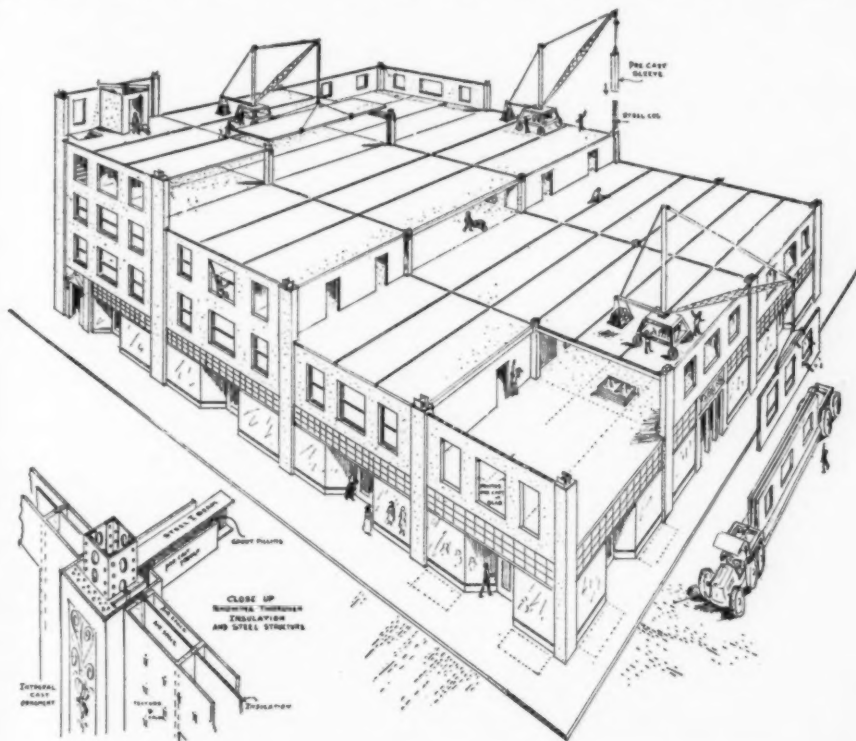


## A New System of Concrete Building Construction

Reinforced Concrete with Hollow Floor, Wall, Roof and Partition Slabs Shows Distinct Advantages

**C**ONCRETE buildings that are insulated against heat and moisture and that can be built by factory methods and yet prove attractive, have been developed by Simon Lake, Milford, Conn., and are known as Lakeolith buildings. These structures are built of reinforced concrete in the form of hollow floor, wall, roof and partition slabs, in which the outer and inner

kinds of buildings and can be had in plain cement or stucco finish or elaborate designs or veneered in stone, slate, tile, glass, terra-cotta, or brick-faced, as desired. Several houses have been built by this new method of construction and have withstood the most severe tests during the past several years. The first experimental house was built in 1918 and since then a number of houses



SKETCH SHOWING LAKEOLITH CONSTRUCTION OF BUSINESS BUILDINGS

walls of the structures are insulated from each other by dead air spaces lying between the multiple walls with an insulating material where the walls join. In large buildings, structural steel is used, but, because of the superior strength of Lakeolith floor, roof and wall slabs for any given load per square foot of surface, a great saving in weight and cost of both concrete and other materials is possible over the present standard types of building construction.

This type of construction is suitable for all

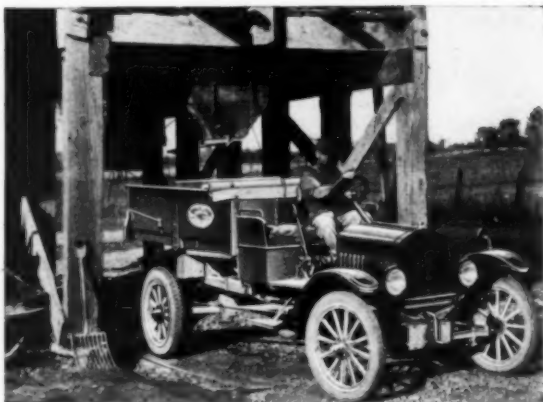
have been built and various methods of manufacturing and assembling them have been tried out. This type of building overcomes some of the objectionable features of ordinary concrete construction. Untreated concrete has a somewhat cold appearance when the walls are cast in steel or wooden forms. Another objection is the necessity of furring, lathing and plastering interior walls to prevent the ready transmission of heat or cold through the walls, as solid concrete walls readily transmit heat or cold.

## The Service of Dump Trucks in Building Concrete Roads

THE value of the small truck equipped with an efficient dump body on concrete road work is demonstrated particularly well on the road job illustrated. A fleet of twelve Ford 1-ton trucks with Eagle No. 62-A dump bodies, made by the Eagle Wagon Works, Auburn, N. Y., were used. At first seven outfits were purchased, and before the job was finished five were added. The contractors' type body has a swinging center partition so that two  $\frac{1}{2}$ -yard or two  $\frac{3}{8}$ -yard batches can be carried on a load and each batch kept separately. This is also equipped with subsills which are 6 inches higher than usual, so that the load fully clears in the dump.

The truck first goes to the bins, receiving the proper measure of crushed stone from the proportioning devices, and then runs direct to the cars, where batch boxes are used to measure out the proper amount of sand, each truck receiving two measured lots. Following this, the truck gets its cement from the storage shed and immediately proceeds to the mixer. On the particular job illustrated, the longest haul of material is about two miles, and very little time is lost in loading either at the bins or from the cars.

About 100 feet in front of the paver the truck runs upon the turntable, is turned around by one man and then is backed up to the paver. The turntable saves considerable time over turning around by truck power, saves the pre-



DUMP-TRUCK RECEIVING MEASURE OF STONE FROM BINS

pared subgrade, and eliminates the possibility of getting off the road and stuck.

After dumping the first batch, the truck drives up a few feet from the mixer to clear the skip and waits until the first batch is loaded into the mixing drum. About the time the second batch is dumped into the skip, another unit of the fleet is waiting to discharge its load. Properly timed, no more than one truck, or an investment of about \$800, is standing idle. This can be compared with big truck operation where investments of ten times as much might be tied up waiting for the mixer.

One of the features of the Eagle dumping equipment is the hold-up mechanism. When the body is used to carry two batches, dumping one batch at a time, the hold-up mechanism can be thrown in by shifting a lever which raises or lowers the bar, exposing the teeth, which engage the hold-up mechanism, keeping the body in the inclined position, or not, as desired.



DUMP-TRUCK RECEIVING CHARGE OF SAND FROM QUICK LOADERS

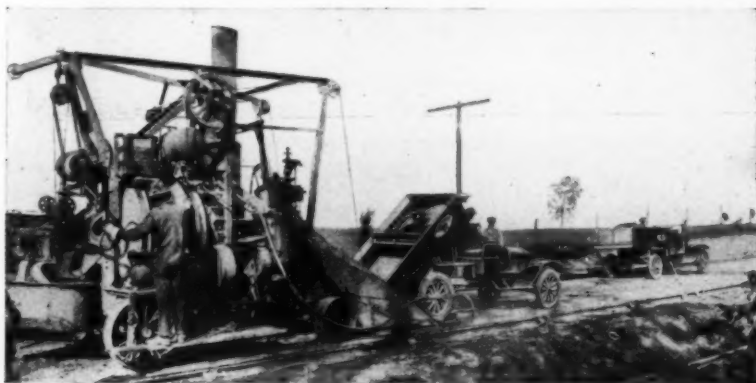
### OUR JUNE FRONT COVER

We are indebted to the Koehring Company, Milwaukee, Wis., for the interesting front cover which appears on this issue of *CONTRACTORS' AND ENGINEERS' MONTHLY*. The shovel is shown working on Avalon Way in West Seattle, Wash. On this job the shovel handled a total of 100,000 cubic yards of material. The road runs along the east of Puget Sound and when completed will add another beautiful scenic highway to those already constructed along the west coast. The shovel is owned and the work is being done by Goetz & Brennan.



TRUCK ON TURNTABLE GETTING  
READY TO BACK UP TO THE MIXER  
TO DISCHARGE BATCH NO. 1

DISCHARGING BATCH NO. 1 INTO  
THE MIXER SKIP



READY TO DISCHARGE SECOND BATCH, ANOTHER TRUCK WAITING

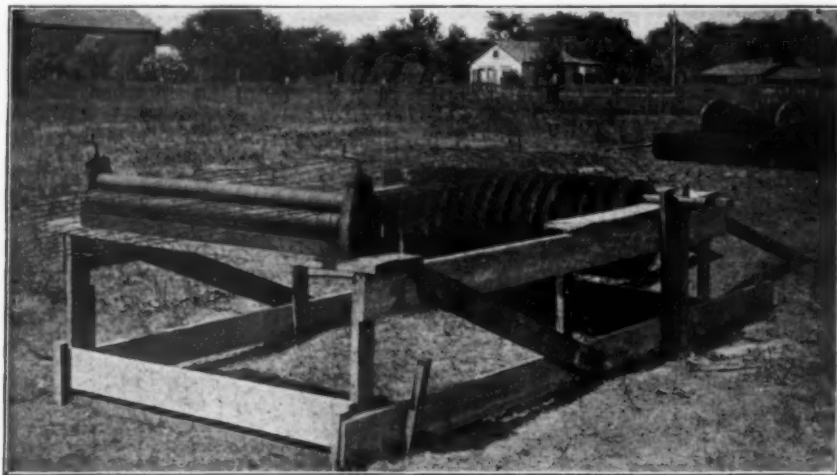
## Concrete Road Construction with Mesh Reinforcement

### Important Features for the Contractor to Consider

**U**NLESS public officials allow estimates on materials placed along the work prior to actual construction, the contractor cannot afford to take deliveries of reinforcing steel much before the time it will be actually needed. Neither can he afford delays due to non-delivery. In describing Triangle Mesh reinforcement, which is manufactured in the Pittsburgh and the Chicago districts by the American Steel & Wire Company, the company states that it costs no more to place in the concrete one sheet of mesh containing from 10 to 30 square yards than it does to place and secure one loose reinforcing bar. Unless the bars are previously wired together in the form of a mat, the placing cost is high and the work is necessarily slowed up because of the extra time required to properly place and secure the

are great as compared with those in handling rolls. The loading into a box car or even a flat car, the unloading from the car to the truck and then to the ground of several sheets of mesh 4 or 5 feet wide and 16 to 18 feet long, bundled together, means higher handling costs. If the reinforcement is for a wide street, say 30 or 40 feet, the extra long sheets of fabric necessary to extend the full width of the pavement are exceptionally hard to handle. If two sheets are used across the street instead of one, then there is the loss due to laps. One man can easily handle in a roll the equivalent of 10 to 20 flat sheets. A minimum cost is involved in the loading, hauling and storing of the reinforcement in rolls.

In every way the roll is the ideal unit to handle until the time arrives to place the reinforcement



**SIMPLE MACHINE FOR FLATTENING CONCRETE REINFORCEMENT SHIPPED IN ROLLS**

several bars needed to cover a yardage equivalent to one sheet of wire fabric.

It is claimed that the Triangle Mesh reinforcement is easy to handle, either in rolls or in flat sheets. In cases where a square or rectangular mesh is desired, electrically welded wire fabric can be secured, made of the same high quality of materials.

#### **Rolls versus Flat Sheets**

It is strongly recommended that mesh reinforcement or electrically welded fabric be purchased in rolls, as in that form the first cost as well as the expense of handling is much less. Except for comparatively short lengths, material in flat sheets is shipped in gondola or flat cars, while fabric in rolls is shipped in box cars. Even for the short lengths, the difficulties encountered

in the pavement. Then it is very convenient to have the material in a flat sheet. Although the majority of pavement contractors have no difficulty in making the fabric sufficiently flat for the purpose without the use of any straightening device, a light portable straightening machine may be secured consisting of three rolls, the necessary end housings and a channel iron base, which holds the rolls and housings in correct positions and furnishes a means for easily and quickly fastening the machine to a suitable wooden frame to be made by the contractor. The top roll is raised or lowered by means of set screws, so that the proper adjustment can be made to insure flat sheets. A sufficient amount of mesh can be pulled through the machine by hand to make one finished sheet, but probably the most economical way is to pull through an entire roll



## "Our Hols Have Stood the Most Severe Tests"

Holt has devoted years of research, pioneering and development work in establishing the leadership of the "Caterpillar"\* in every branch of engineering, contracting and industrial service. No mere peculiarity of design or mere "selling features" could ever have made the "Caterpillar" what it is today. The host of quantity orders we continually receive from large firms and international buyers, and the numerous repeat orders we receive from our old customers, tell their own story of how the "Caterpillar"

makes good. As stated in a recent letter from Longerbone Brothers, prominent contractors, Des Moines, Iowa—

"No blue print, specification, guaranty or 'sales talk' will make a tractor do anything, or be anything. There is just one test of efficiency: PERFORMANCE. Our Hols have stood the most severe tests."

Our booklet, "Caterpillar" Performance, will interest every contractor, engineer and road official. Still better, we urge you to investigate "Caterpillar" Performance in the field.

### THE NATION'S ROADMAKER

\* There is but one "Caterpillar"—Holt builds it

**THE HOLT MANUFACTURING COMPANY, Inc.**

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at one time, using horse or automobile power. Stakes driven into the ground, or marks made on a sidewalk at distances apart equal to the required length of sheets, makes a convenient method for measuring off for cutting. The cutting of the mesh is then easily done by means of wire snips or bolt cutters, which can be secured from any hardware dealer.

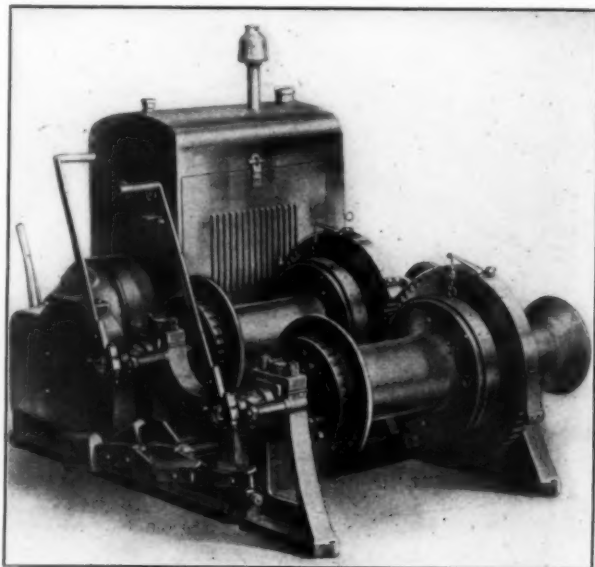
Two men and a team or an automobile will cut up and stack in an hour and a half as much reinforcement as will be needed for an entire day's run. The team or the automobile will be required for only a part of this time. The straightening device can be easily moved along as the work progresses, thereby eliminating the necessity for carrying the sheets any great distance.

## A New Gasoline Hoist for Contractors

Portable Hoist Now in Use on a Number of Eastern Contracting Jobs

**U**SERS of hoisting machinery have many calls for a portable all-round gasoline hoist. The Mead-Morrison Manufacturing Company, East Boston, Mass., manufacturers of a line of steam and electric hoisting equipment, have developed a new gasoline hoist known as the Handihoist. Before manufacturing this gasoline hoist on a commercial scale, the engineers of this company made a close study of the good and bad points of various types of gasoline hoists and then constructed experimental machines, modified to fill the exacting requirements of general contracting work.

The new hoist is in active use on a number of contracting jobs in the East and has shown its ability to stand up under hard use. It is a single-drum machine, made double-drum by bolting on a second unit when desired. The hoist is equipped with cut gears, asbestos-lined frictions and brakes. It has bronze bushed drums, machined all over. Power is supplied by a LeRoi engine.



SINGLE GASOLINE HOIST MADE INTO DOUBLE UNIT BY BOLTING ON AN ADDITIONAL DRUM

## Book Reviews

### THE BUILDING ESTIMATOR'S REFERENCE BOOK AND THE VEST POCKET ESTIMATOR

By Frank R. Walker, author of Practical Accounting and Cost Keeping for Contractors. Frank R. Walker Company, Chicago. 1924. VI + 1,597 pp. Fifth edition. \$10.00.

The fifth edition of this valuable book was completely revised and rewritten before printing. All material prices and wage scales used throughout are current at the time of going to press. The data have been condensed as much as possible, to furnish complete itemized estimates on every class of construction work, that is, data that can be compared and checked in actual practice.

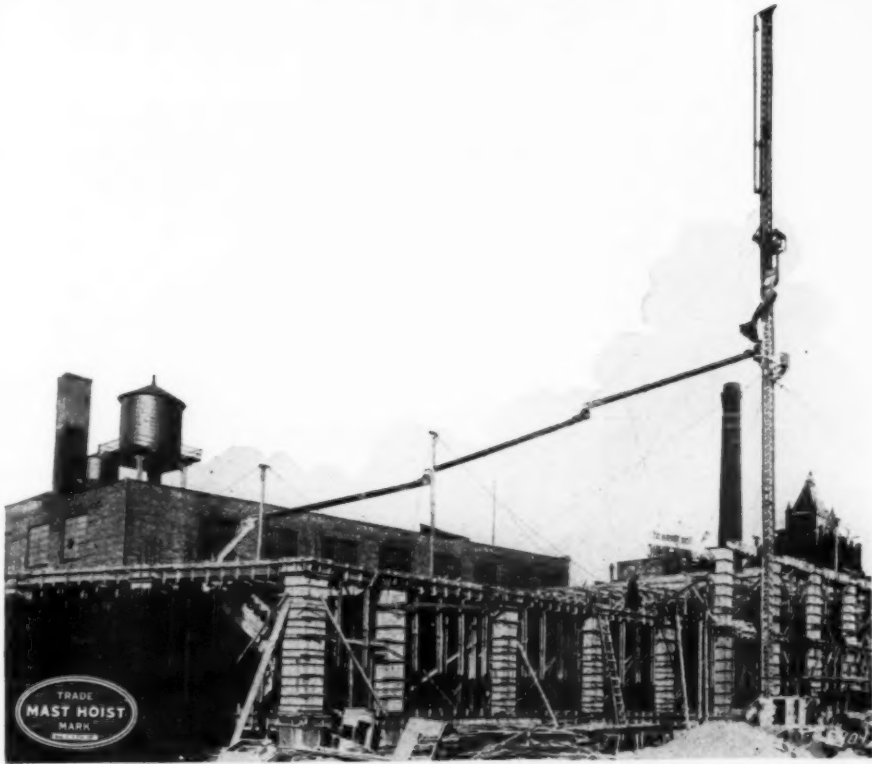
From the estimator's view-point the book is particularly well arranged, as the information appears in the manner in which it will be used, permitting the insertion of local material prices and wage scales where necessary. Experienced estimators who have a complete knowledge of their work will prefer their data in more compact form and will appreciate the Vest Pocket Estimator which accompanies this edition. It contains in tabular form all information the busy estimator needs for every-day use. The reasons for various figures are given in the larger book, while the new book is small enough to be conveniently carried in the vest pocket. In order to facilitate the use of the Building Estimator's Reference Book, as it will be used in all parts of America and many foreign countries where material prices and labor costs vary

greatly, all labor costs have been stated in the quantity of work a man will perform per hour or per day, together with the number of hours required to complete a certain unit of work. In each instance a certain basic price is used, but in all possible instances the user should insert the wage scale and material prices applying to his particular locality, to secure the most accurate estimates. It is impossible to list in a brief review the ramifications of the subjects covered in this invaluable book. It must suffice to say that it is a complete work covering every phase of building from basement excavation to ridge-poles, heating, plumbing and electric wiring.

### DIRECTORY OF CEMENT, GYPSUM AND LIME MANUFACTURERS, WITH WHICH IS INCLUDED SAND, GRAVEL AND CRUSHED STONE PLANTS

Eighteenth Edition, compiled and published by Cement, Mill and Quarry, Chicago, Ill. 1924. 892 pp. \$3.00.

This directory, corrected to April 1, 1924, presents a very complete list of manufacturers of cement, gypsum and lime and producers of sand, gravel and stone, so that any prospective purchaser of these products may locate at a glance any near-by mill or quarry. It also presents a very complete directory of all machinery and supply manufacturers who can supply the product used in the construction or operation of cement mills, as well as gypsum or lime plants and pits or quarries.



## *Greater Possibilities*

**T**HE INSLEY STEEL MAST HOIST plant has greater possibilities for the handling of either a 7-S or 14-S batch than almost any other equipment available to the concrete builder.

Its purchase and erection costs are such it does not mean the tying up of anticipated profits in equipment on the medium sized job.

Its operating efficiency is superior to that of the wood tower equipment heretofore used in that it is possible to reach 60 ft. with self supported chuting.

Its salvage value is high in that outside of chutes and sheaves there are practically no parts subject to wear. It is good for job after job.

If you have concrete to build it will pay you to write for Catalog No. 45.

**INSLEY MANUFACTURING CO.**  
*Engineers and Manufacturers*  
**INDIANAPOLIS**

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## A New Lettering Guide

When Used with Special Pens Makes Engineering Lettering Easy

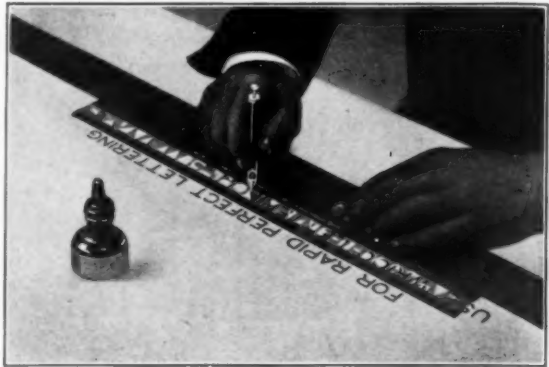
IT is difficult, even in these days of great productivity of engineering schools, to find men who can letter rapidly, well and uniformly. In order to make use of men with little training and yet produce uniform lettering for engineering work, the Wood-Regan Instrument Company, 154 Nassau Street, New York City, has developed the Wrico lettering guide and lettering pens.

The lettering guide illustrated below consists of a strip of transparent green Pyralin perforated with various openings which are readily combined to form all of the letters of the alphabet, the numerals and the various symbols. The guide is grooved on the underside, so that it may be moved from one character to another without smearing the ink. A separate guide is provided for each size of letter from  $\frac{1}{8}$ - to  $\frac{1}{2}$ -inch, and each guide, except the smallest, may be used with four sizes of Wrico lettering pens, giving different bodies to the letters. One particular feature of the guide is the shift button, which, after the first portion of a letter is made, is slid to the end of the shift slot, pressed to the paper and the guide shifted, bringing the second part of the letter exactly in the right position to complete the character. This saves time and insures perfect characters.

### The Lettering Pen

Wrico lettering pens have been designed particularly for use with the guides described above. The pens are made in five sizes, four of which may be used with any of the guides except the  $\frac{1}{8}$ -inch size, which is used with the other size of pen. Having the different sizes of pens makes it possible for the user to obtain lettering of a considerable range of appearance with each size of guide.

By the use of this lettering outfit, all characters



USING A LETTERING GUIDE MAKES LETTERS PERFECT

are made uniformly and perfectly. The style is the standard vertical Gothic commonly used by engineering draftsmen, a style that is clean-cut and easily read and presents a pleasing appearance. Very little practice is necessary to operate these lettering guides quickly, and very soon it is possible to letter more rapidly than by any other method, including free-hand lettering. It does away with the disadvantages of guide lines or previous blocking out of letters. All the characters and letters are made complete, so that no retouching or filling-in is required. Inasmuch as the letters which have been completed and the outlines of the letter about to be made can be plainly seen through the lettering guide, it is easy to correctly space the letters. Blotting of the work is almost impossible, as the central portion of the guide is raised above the writing surface so that it may be moved without danger of smearing the ink.

## How Roads Are Resurfaced in New Mexico

A ROUGH, corrugated section of highway on Federal Aid Project No. 48, located between Chaves and Dexter, Chaves County, has been turned into a smooth one as the result of an experiment reported to the State Highway Department by W. C. Davidson, District Engineer in Charge of District No. 2 in the southeastern quarter of New Mexico.

The caliche surfacing on this project had become deficient in binder on account of dry weather and high winds, which followed immediately after completion. A "chuggy" condition resulted, according to Mr. Davidson. Ordinary maintenance methods failed to secure uniformity of surfacing. The experiment was then decided upon and carried out as follows:

1. A heavy scarifier was drawn over the road, the surface course being penetrated to a depth of 3 or 4 inches.
2. A farm harrow was then used to bring the large size gravel to the top.
3. The crown of the road was brought to section with a maintainer and a flat drag, roadside material for binding being brought in from the shoulders.
4. A roller was then used to compact the surface.

According to the report, the cost was \$125 for the distance so treated, which amounted to 8/10-mile. It is probable that this cost can be reduced by covering a greater mileage in one continuous operation.



## Low Upkeep and Operating Costs Even In Stone Hauling!

Stone hauling—considered about the toughest hauling job in contracting and building work—finds this 5-ton Garford in every way fit for the task.

Like the eight other Garfords owned by R. Waddington & Sons, Inc., of Hoboken, N.J., it was built specifically for this purpose. It, therefore, has the structural strength and motive power needed to stand the severe loading and carrying strains of such heavy work.

The sturdy chassis with its well braced cross members, the heavy resilient springs protected from breakage by Garford 3-point shackles, the strongly

reinforced body and the mighty engine—all embodying the unusual stability characteristic of Garford construction—assure a freedom from repair and replacement expense that has meant much in the extremely low costs which this company reports.

Garford Engineers have studied the hauling needs of the building industry for many years. They know how to build a truck that will handle any job, big or small, on a lower ton mile cost basis.

Put your problems up to them. They will gladly analyze your requirements and make recommendations. Write them today.

**The Garford Motor Truck Company, Lima, Ohio**

Manufacturers of Motor Trucks 1 to 7½ Tons

# GARFORD

## DEPENDABLE TRANSPORTATION

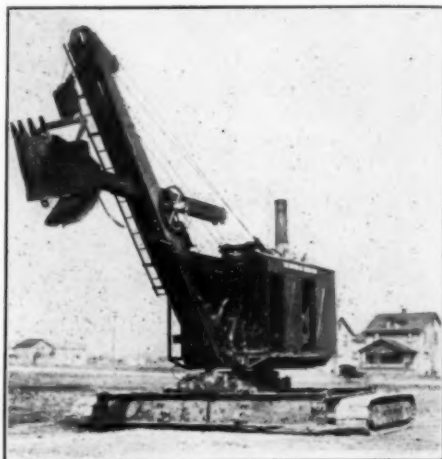
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## A Steam Shovel for Sewer Trenching

New 1¼-Yard Continuous-Tread Machine Equipped for Handling All Kinds of Sewer Work

**T**HOMAS HOLAHAN, contractor, Rochester, N. Y., has the contract for excavating about 5,000 feet of trench for a 72-inch concrete sewer in Rochester, N. Y. The excavating runs 16 to 25 feet in depth, and the first 8 feet is earth and the remainder limestone rock. To handle this work, the contractor is using a standard 1¼-yard Osgood heavy-duty continuous-tread steam shovel equipped with 1-3/4-yd dipper, 25-foot boom and 18-foot handle. The machine is also equipped with an auxiliary hoisting drum for use as a dragline or clam-shell outfit.

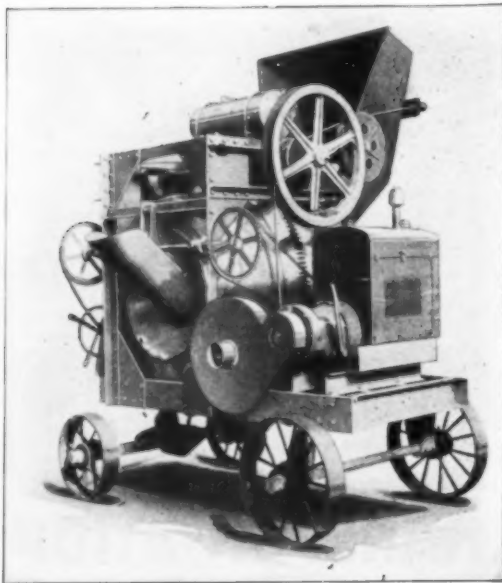
In addition to the standard equipment, a 34-foot dipper handle and special continuous-tread mounting were included. The mounting is of structural steel, designed for attachment to the regular continuous-tread frame. The special frame measures 26 feet in width over-all and is designed for spanning sewer trenches without the use of mats. The tread is gear-driven and has the same flexibility as the standard continuous-tread. This equipment with the wide span of the treads is particularly useful in sections where little or no bracing is needed in the trench, and also completely does away with the delays and dangers attendant on the moving of mats from front to back.



STEAM SHOVEL WITH ONE-YARD DIPPER AND WIDE-SPACED CONTINUOUS TREAD FOR SPANNING SEWER TRENCHES

## More Compact Construction for Concrete Mixer

Portable Construction Mixer Made Lighter



INCREASED UTILITY THROUGH DECREASED SIZE WITHOUT LOSS OF CAPACITY

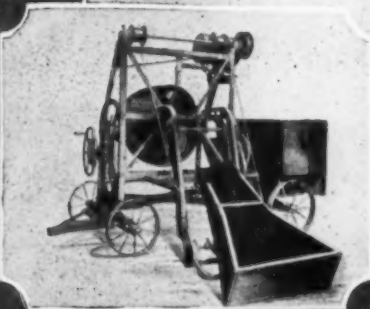
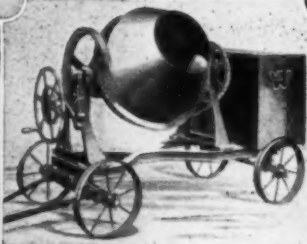
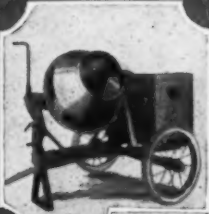
**A** NEW development of the Smith 14-S non-tilting concrete mixer has been announced by the T. L. Smith Company, Milwaukee, Wis. The new mixer is shown in the accompanying illustration. It embodies greater compactness of construction, permitting mounting on shorter trucks, thereby making the entire machine lighter and greatly increasing its range of activities through its greater portability. The picture shows the Smith 14-S mixer equipped with power loader, water-tank, and 15-h. p., 4-cylinder Le Roi power unit. Strongly built gear guards protect the workmen and at the same time prevent falling aggregate from dirtying and injuring the gears. This two-bag mixer, which gives a daily production of more than 150 cubic yards, is applicable to almost every kind of construction work.

### Allis-Chalmers Takes Over Worthington Plant at Cudahy, Wis.

**T**HE Worthington Pump & Machinery Corporation, having decided to close its Power & Mining Works at Cudahy, Wis., and to discontinue its crushing cement, mining and creosoting machinery lines, the Allis-Chalmers Manufacturing Company, Milwaukee, Wis., has taken over all the records, drawings, patterns, patents, jigs, fixtures and manufactured stock pertaining to these lines and will continue their manufacture at the West Allis works.



# WONDER MIXERS



**WONDER** Mixers are built in sizes that meet every need of the contractor, ranging from a one-half bag per batch size up to and including a three bag capacity.

In each size is included the well known **WONDER** features of a fast, visible mixing action—a quick charging, ball-bearing drum—a rapid-pouring discharge—a dependable power plant and a sturdy design throughout.

These are only a few of the proved advantages of the **WONDER** which design is thoroughly illustrated and described in the new **WONDER** catalog. It's to your advantage to obtain this catalog as well as our latest prices.

Write today.

**Construction Machinery Co.**

447 Vinton St., Waterloo, Iowa  
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## A Compressed-Air Spader or Clay-Digging Tool

Light Equipment Speeds Up Work in Tunneling or Trenching in Stiff Blue Clay and Similar Materials

**R**EMARKABLE results have been secured with compressed-air spaders in excavating stiff clay in trenches, open cuts, caissons and tunnels in which the ground is not sufficiently hard to be drilled and shot and yet is too hard to be handled readily by the ordinary pick-and-shovel method. The Sullivan compressed-air spader or pneumatic clay-digging tool, made by the Sullivan Machinery Company, 122 South Michigan Avenue, Chicago, Ill., which is well adapted to this work, consists of a light Sullivan air hammer weighing only 17½ pounds, requiring ½-inch air hose, and equipped with a steel spade and special retaining ring or bushing.

The cylinder is provided at the rear end with a handle secured to it by side rods, and at the other with a special one-piece retainer for holding the steel spade in the nose or chuck of the hammer. A hollow, cylindrical or shell valve is employed, operated by differential pressure. The hammer or piston runs up inside the valve itself, thus providing a long stroke without excessive length of tool, or undue weight. The drill is operated by pressure on a trigger or thumb throttle placed at the top of the handle grip, where its action will not be hindered by an accumulation of mud or grit.

The spader strikes a hard, snappy blow, giving abundant power for the work to be done, and

satisfactory work can be accomplished at any air pressure from 45 to 100 pounds, although a higher range of pressure is strongly recommended, particularly for stiff ground.

The application of compressed air to the handling of stiff clay is a very important step in advance and means a large reduction in labor costs, together with increased speed of construction on a large variety of jobs. In tunneling in very hard and dry blue glacial clay in the Chicago district, compressed-air spades increased the output per miner from 3 to 4 cubic yards per 8-hour shift, to from 8 to 10 cubic yards, and the limit of the work accomplished was governed by the ability to get rid of the muck, instead of by the rate of digging, as formerly.

### New Detroit Branch Manager

**I**NDUSTRIAL WORKS, Bay City, Mich., has announced that Fred J. Mershon, who for many years has been Export Sales Manager of the company, has now taken entire charge of the Detroit Branch Office located in the Book Building.



SULLIVAN  
"DE-361"  
SPADER

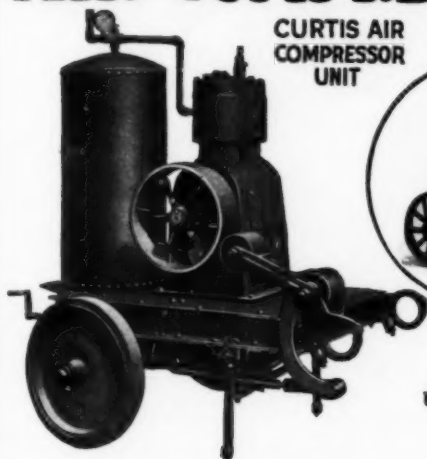


SPADERS WIDENING A STATION CHAMBER, CITY AND SOUTH LONDON UNDERGROUND RAILWAY, ENGLAND

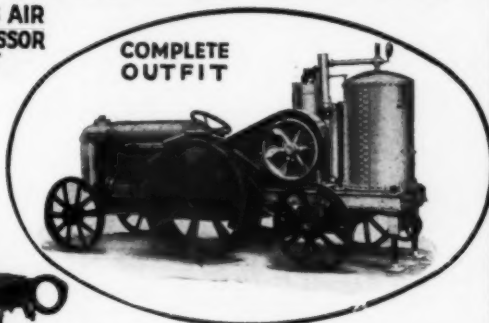
About 60 of these spaders were used on this enterprise, in stiff black clay. As many as 10 spaders were employed on one face at the same time

SPADER FOR TRENCH EXCAVATION, WITH TEE GRIP AND LONG SHANK (5-IN. SPADE)

# CURTIS-FORDSON AIR COMPRESSOR OUTFIT



CURTIS AIR  
COMPRESSOR  
UNIT



COMPLETE  
OUTFIT

Sold as Complete Outfit or  
Unit Can be Bought Separately

## Fills A Much Needed Want

Here is just the thing contractors are waiting for—a portable air compressor unit that operates with any Fordson Tractor, making a complete self-contained outfit. Can be used on a hundred different kinds of jobs where a supply of compressed air is temporarily needed. An outfit that can be moved from job to job quickly by its own automotive power—no extra truck for pulling necessary.

### 50% More Service

The average contractor can easily get 50% more service out of the Curtis Fordson Compressor Outfit than from the ordinary portable compressor outfit, which is heavy, cumbersome, expensive and serves only a single purpose. It must be remembered that the Curtis Fordson has every quality of the ordinary portable compressor outfit plus the advantages of detaching the Fordson Tractor and using it for all tractor purposes.

### Wide Range of Uses

The flexibility of the Curtis Fordson Air Compressor Outfit is remarkable—ideal for the road contractor, structural steel field jobs, oil field work, telephone construction, well drilling, etc. Just the thing to supply air for jack hammer drills, paving breakers, riveting hammers, rammers and tampers, compressed air hoists, sand blasts, stone cutting tools, quarry tools, rivet forgers, clay and coal mining diggers, for pumping water, for washing autos and trucks, unloading tank cars, paint spraying, caulking pipe lines, etc. For city streets can be equipped with rubber tires.

### Tractor Used Independently

When the Curtis Fordson is not being used as a compressed air outfit, the Fordson Tractor can be detached and used independently for hauling, loading, moving or power-driving purposes. The coupling is simple—nothing to get out of order or misfit. The whole arrangement is sturdy and practical—the Air Compressor Unit can be attached or detached by anyone in a few moments.

**Curtis Pneumatic Machinery Co.**  
1671 Kienlen Ave. St. Louis, Mo.

### If You Now Have a Fordson

The Curtis Air Compressor Unit can be purchased separately. Used in connection with a Fordson, it opens new fields of work for the tractor and an additional source of revenue for you. You know the reliability of the Fordson—and you know the reputation and dependability of Curtis Air Compressors. The Curtis Unit is backed by 70 years' manufacturing experience, 27 of which have been devoted to the manufacture of pneumatic machinery, and our \$1,500,000.00 institution. So you take no chances whatever.

### Reasonable in Cost

The Curtis Fordson Air Compressor Outfit can be purchased complete, tractor and all, from us, or the Curtis Compressor Unit can be had separately. Mail coupon for full particulars and prices.

1671

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Complete  
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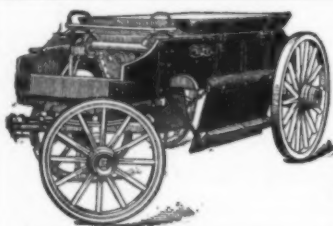
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 CALCIUM CHLORIDE

## Cures Concrete Pavements Better---Quicker---Cheaper

With the old method five men are required full time to cover pavement with earth. But with *Dowflake* one man can cure the same pavement with two hours' work by spreading *Dowflake* with a small spreader.

Three men are required full time by the old method to keep the surface wet and even then, continuous inspection is necessary to maintain uniform covering of earth and approximate uniformity of moisture. With *Dowflake* no wetting or other work is necessary.

The old method of ponding or covering with earth or straw required considerable labor for removal of such material. *Dowflake* leaves a clean pavement, the material being absorbed.

The old method often meant a full crew loafing at the mixer because the inspector required all water for curing. With *Dowflake* you need never worry about this waste, because *Dowflake* absorbs moisture from the air, holds it in intimate contact with the concrete until curing is completed.

States that have standardized on curing Concrete with *Dowflake* say that the pavement is cured in shorter time and there is no worry on the part of the inspector. *Dowflake* has stood government, state and county tests. It is approved by leading engineers and contractors. It saves a lot of time and money.

Illinois has the most pretentious paving schedule of all states and is curing more pavement with *Dowflake* than by any other method. Descriptive literature on concrete curing and road maintenance is available on your request. Use the coupon,

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The Dow Chemical Company  
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Send me the following—

- ☐ Book on "How to Cure Concrete."
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To Cure.....yards concrete pavement.

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# 48 hours equal 7 days!

Tests made by the Bureau of Standards and the Solvay Process Company prove that Portland Cement gauged by a solution of Solvay Calcium Chloride attains greater strength in 48 hours than a corresponding mixture with plain water attains in 7 days!

The final set and strength of the concrete are in no way affected by the use of Solvay. In fact, tests indicate the final strength is increased by its use.

Solvay also water-proofs, strengthens and protects concrete against freezing temperatures.

*use*

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Solvay is shipped in 375-pound non-returnable metal drums or easy to handle 100-pound moisture-proof, burlap paper lined bags.

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*Don't forget that Solvay accelerates the set of concrete and can be used often to advantage in the mix!*

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**Monarch**  
THE MOST  
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Koehring Heavy Duty construction is the surest profit factor you can put on a job.

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7, 10, 14, 21, 34 cu. feet of Mixed Concrete

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4 and 7 cu. ft. Mixed Concrete

Steam or gasoline power. Power charging-skip or low charging platform with hopper, light duty hoist, automatic water measuring tank. Standard or flanged rim steel wheels, or disc wheels, rubber tired. Mixes mortar as well as concrete.

Write for Paver Catalog P-6

### KOEHRING COMPANY

Pavers, Mixers, Cranes, Draglines, Gasoline Shovels

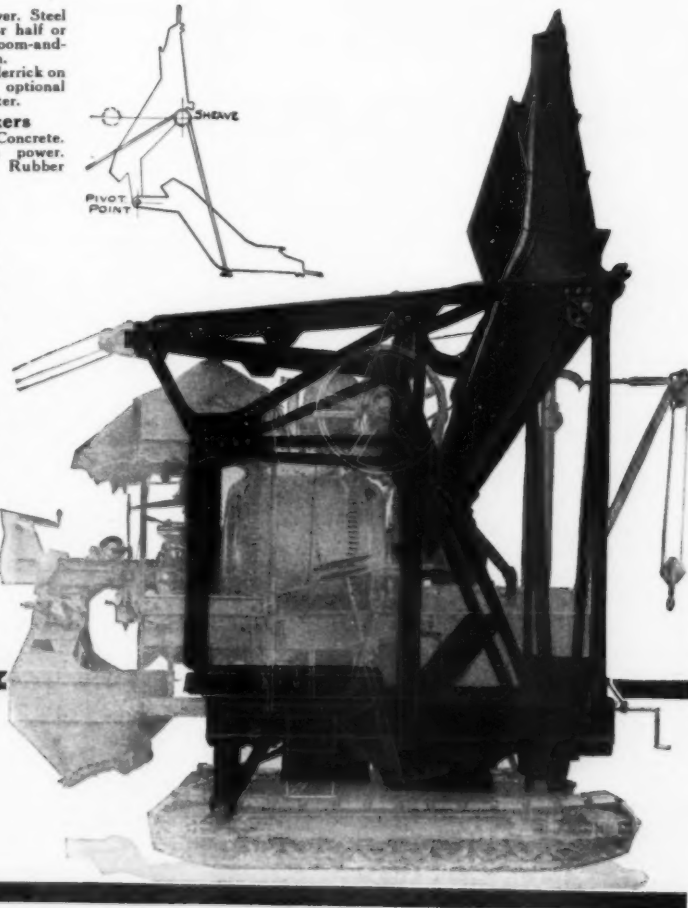
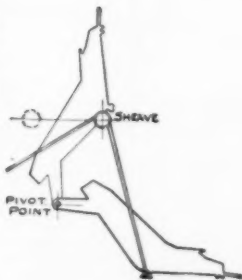
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We want to help you get the right kind of dump body equipment for your trucks. Heil Bodies are custom-built to suit your exact requirements. Heil Hydro Hoists are made in five sizes for every make or model truck. A complete stock of Heil-Ford bodies, hoists, and tanks are at all times kept in stock ready for immediate delivery.

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Baby Plugger for drilling holes and cutting ducts in concrete.

Concrete Busher for bushing concrete surfaces.

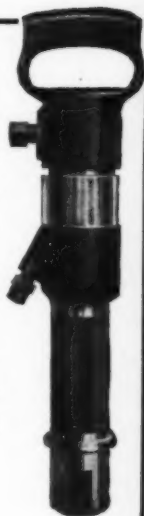
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**Double Action Finishing Tools**  
*"They put a man on his feet."*



The steel float illustrated here is as fine a tool as the well-known Abram long-handled trowel. For rough surfacing, for road work, and wherever a high grade float finish is desired, this float of heavy steel will cut finishing costs seventy-five per cent.

There is an Abram double-action tool for every type of work. Send for catalog.

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*Publishers of "The Finishing Touch."*

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Our engineering department is well prepared and always glad to analyze special problems of motorized equipment and will submit an unbiased recommendation, with no obligation to you.

INTERNATIONAL MOTOR COMPANY  
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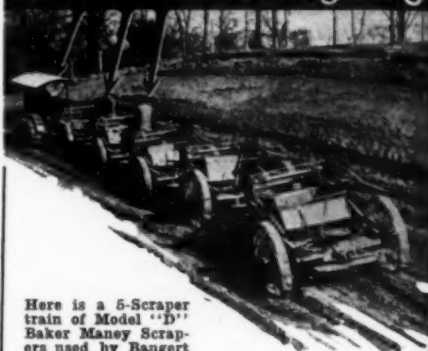
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Here is a 5-Scraper train of Model "D" Baker Maney Scrapers used by Bangert Bros. on highway work near St. Louis, Mo. They are moving 500 to 600 yards of dirt per day with only three men.

If you are paying for mules, teams, drivers and a lot of "riff raff" labor, then you will have to admit that this message is for you.

If your payroll and operating costs are eating into your profits, then we know you have overlooked the "Maney" way.

Your payroll can be cut 50 to 75 per cent. Two to three men can roll up a total of 400 to 700 yards a day with trains of three to six Maney Scrapers. No long stops or delays but steady yardage day after day.

Write for name of nearest representative. Illustrative catalog No. 209 is ready—send for it.



Model "D" 1½ Yard

The only self-loading scrapers of large capacity which can be loaded and hauled by the largest tractors.

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For Heating and Applying under Pressure all varieties of Bituminous Materials, Hot or Cold, for Road Construction, Maintenance of Dust Laying.

Heat and volume under instant control of operator. Positive pressure produced by the Kinney Pump.

## Auto Heater and Distributor PATENT COMBINATION

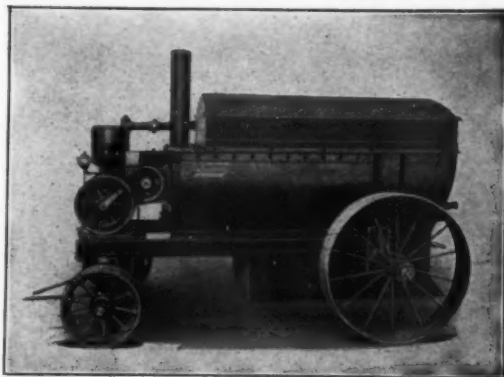


## HANDY HEATER and SPRAYER

Especially adapted for Road maintenance, construction and general repair work. Contents constantly agitated while heating.

No burning or coking of materials, Pump, Piping, Hose, Nozzles, Automatically Heated.

No Steam Required.



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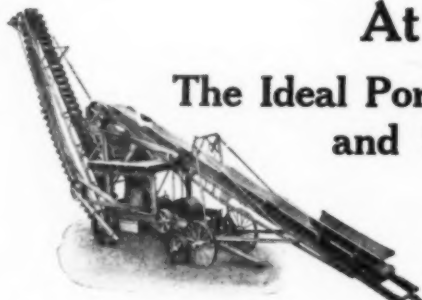
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### The Ideal Portable Gravel Crushing and Screening Plant

Gravel is brought from the pit in wagons, drags or fresnos, and dumped through a trap directly upon the conveyor, which in turn deposits the material upon a grizzly screen. The undersized material drops through the bars of the grizzly upon a

chute leading directly to the elevator, while the over-size rolls down the bars into the crusher.

Nos. 2, 3 and 4 Austin Gyratory Crushers can be mounted on trucks and furnished with rigid or folding elevators of the required lengths, and gravel conveyors ranging in length from 30 feet to 50 feet. Optional equipment includes a revolving screen mounted on a portable bin.

While moving from place to place, the elevator folds down over the crusher; the conveyor is disconnected from the crusher and its lower end attached to a truck or wagon.

*A special bulletin describing these portable plants in detail is just off the press. We would like to send you a copy. Ask for Portable Gyratory Crusher Bulletin "H."*

**THE AUSTIN-WESTERN ROAD MACHINERY CO.**

400 N. Michigan Avenue,

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## HUBER ROADTOOLS

### MAINTAINERS - ROLLERS

The Huber Four Cylinder Gasoline Roller starts easily, has surplus power and convenient to handle. Air controlled scarifier folds under when not in use.

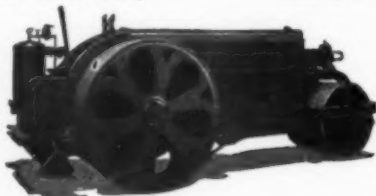
The Huber Steam Roller has been standard equipment with road builders for many years. Always dependable. The Huber One-Man Road Maintainer is economical and the four cylinders furnish excess power. Has weight enough to hold blade down when making heavy cut and pulls a detached grader when necessary.

*Write for illustrated folders on any Huber Road Tool.*

**THE HUBER MFG. CO.**

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### The BARTON Portable Pumper

Shown in action using the motive power your car affords. The Barton Pumper equipped with the Automatic Vacuum Primer, makes the ideal pumping outfit for use in construction work, contracting, etc.

*Send for Descriptive folder.*

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## SWATOW, CHINA

*paves with TEXACO Asphalt*

In addition to the 669 cities and towns of the United States which have paved with TEXACO Asphalt, there is a certain amount of interest in the fact that communities in other parts of the world also pave with Texaco.

The illustration at the head of this page shows Chinese coolies constructing a Texaco pavement in the city of Swatow, China, one of the leading cities of the Orient.

Texaco pavements also are to be found today in England, France, Australia, Brazil, Cuba and other parts of both the Eastern and Western Hemispheres.

In this world-wide service Texaco Asphalt encounters an unusual variety of traffic and climatic conditions. The fact that it is serving so satisfactorily under so many flags has a deep significance for American engineers and contractors.

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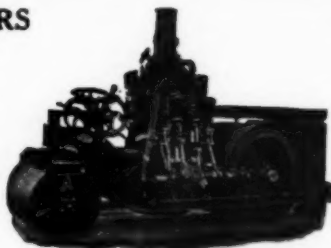
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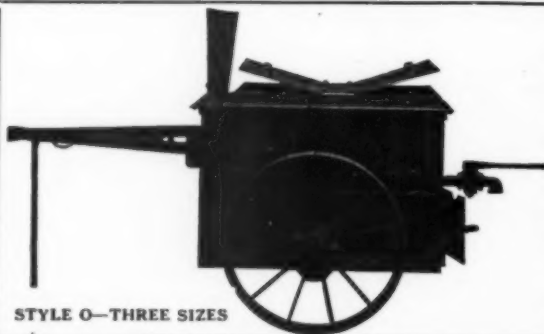
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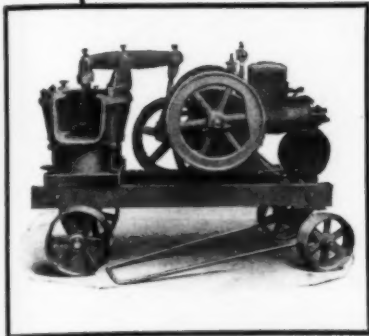
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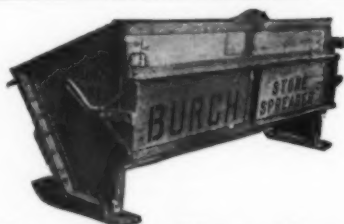
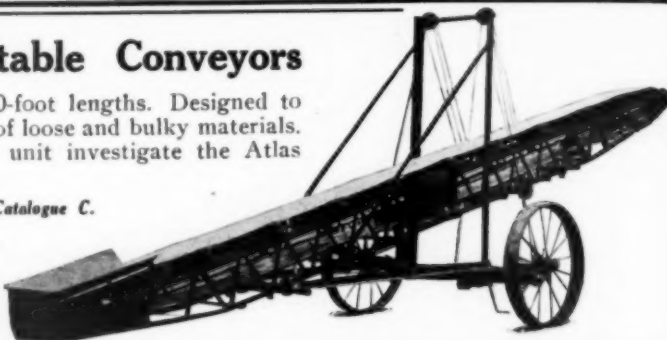
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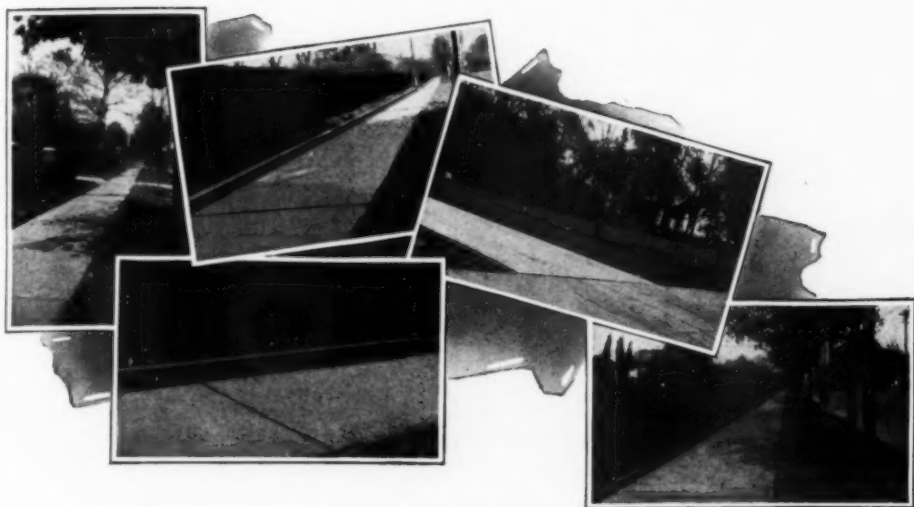
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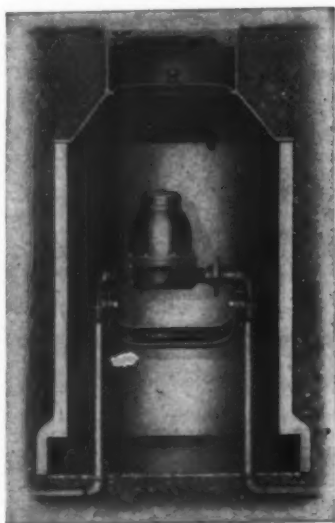
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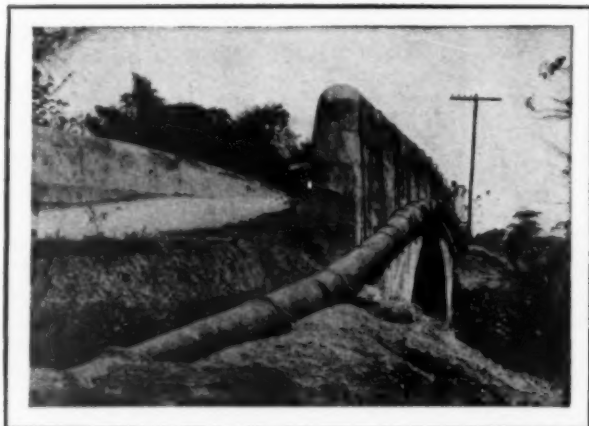
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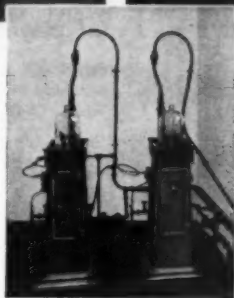
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